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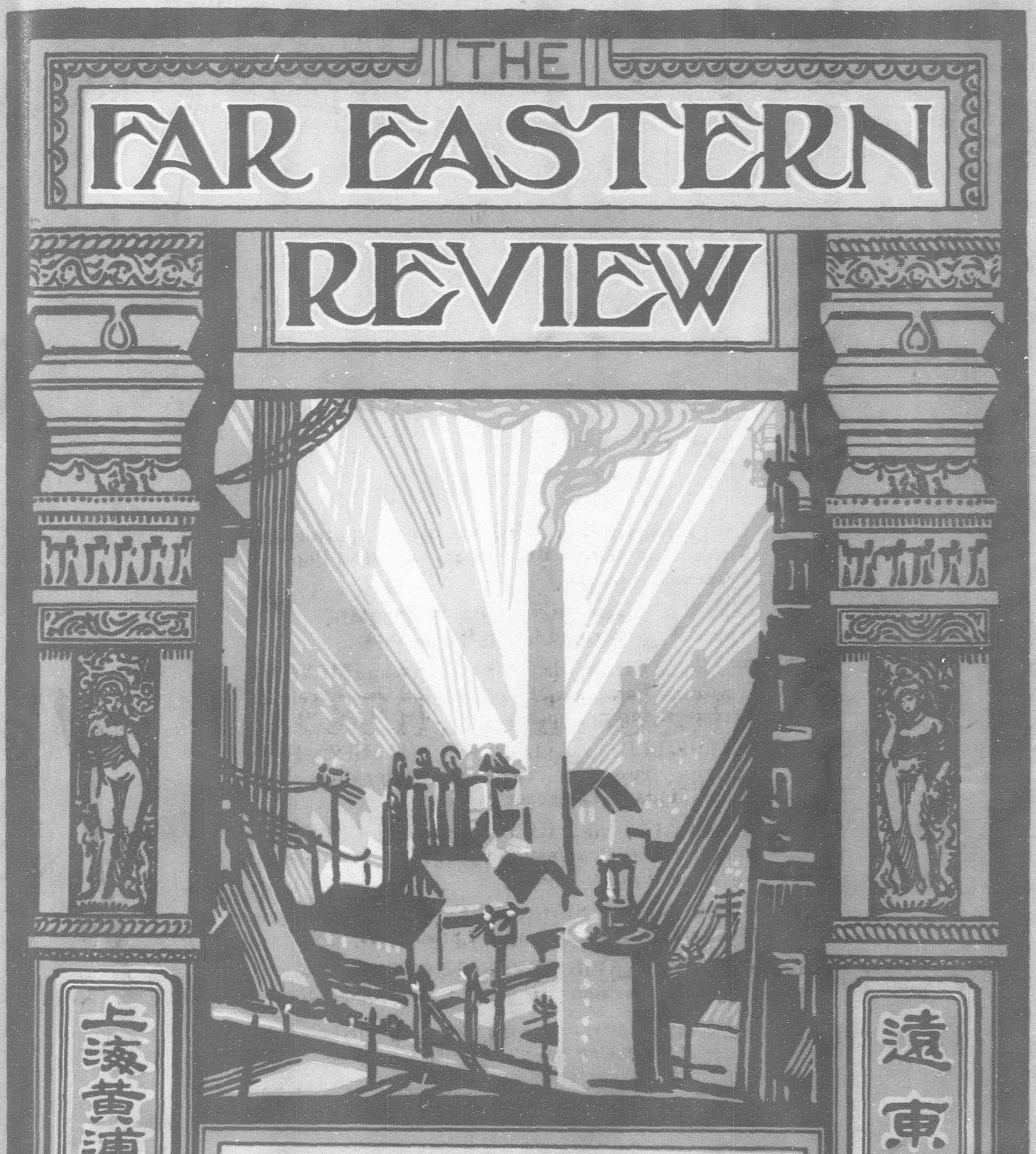

MORE LIGHT

THE WILL OF THE PEOPLE OF MANCHOUKUO

THE LEAGUE'S TASK

THE OUTLOOK IN CHINA

THE CHINESE COTTON INDUSTRY

Vol. XXIX | AUGUST, 1933 | No. 8

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The Far Eastern Review

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VOL. XXIX SHANGHAI, AUGUST, 1933 No. 8

More Light

Disclosing a Changing Viewpoint in America on Far Eastern Affairs

By C. J. LAVAL

SIGNS and portents in Far Eastern political skies seem to indicate that an era of enlightenment at length has dawned in the Occident, succeeding a time of grave misunderstandings. The pacifists and moralists, who unconsciously, perhaps, in their clamor last year, were bent upon warfare, are subdued—and, possibly, are better informed. The inaccuracies of the Lytton report stand revealed, and the report is become simply a document of academic interest. The debating group at Geneva solemnly enact measures anent athletic tourneys and vote their little resolutions as heretofore, but disillusioned news editors put these things under microscopic headings among the want ads. These conditions measure the changes of a twelvemonth and herald a new shaping of public thought in the western world, clarified by lately acquired knowledge that the controversy in the Far East has two sides.

After her defeat in the war with Japan, China, helpless then as she has remained helpless ever since to act for herself, has bent all the moves of her diplomacy to the effort to embroil the Island Empire with a major power to the end that Japan might be crushed. This may be a purely human reaction, but thus far it has worked out calamitously for China. It was this hope for revenge that inspired China's leaders—who also saw some considerable personal gain in the situation—to enter the secret alliance that caused the war between Russia and Japan. China's hopes crashed in the Russian defeat, but China escaped unscathed, for the secret of China's alliance with Russia remained a secret for twenty years and, in fact, complete official cognizance of the document hidden in the archives of the American State Department has never yet been achieved.

China's wish for the destruction of Japan has never wavered, for when Russia was eliminated she turned her eyes overseas toward the United States, fostering with every care the ready American sentiment and sympathy for a weak sister. In these efforts China had the cordial support of the tremendously influential missionary organizations and she was aided effectively also by every foreign interest inimical to or fearful of the expanding might of Dai Nippon. In that acute period after the Great War when feeling between the United States and Japan, following other and earlier crises, had been whipped to searing intensity, an ominous situation developed, for then the war-impoverished European nations whole-heartedly supported China's aims, because these European nations then welcomed the prospect of a war in the Pacific between the only two powers that had emerged from the Great War with huge profits—profits that would have flown back into Europe, to say nothing of effects on Far Eastern trade, had such a war been brought about.

Mr. Roy W. Howard, Chairman of the Scripps-Howard Newspapers

Since that time and for more than a decade the editorial policy of *The Far Eastern Review* has been dedicated to the purpose of pointing out, from a purely American standpoint, the futility and the devastating consequences of any conflict between Japan and the United States—however such a conflict might end. It is inspiring, therefore, after all the hullabaloo at Geneva and all the published clamor of last year to discern a new light on the horizon in the west. Matsuoka on his way home from Europe said to an interviewer in New York last winter that the hearts of the American people were with China, but that the common sense and fairness in their heads at length would bring an understanding of the realities of the situation in the Far East. Something of this sort has been happening and this is reflected in the utterances of the most prominent publicists in America.

The Scripps-Howard Newspapers

In the world of journalism in America perhaps no greater force for the shaping of public opinion exists than the Scripps-Howard newspapers and the

allied publications that they serve through the United Press. This huge publicity machine with its news gathering and news distributing agencies scattered throughout the world has a distinctive place in American life in that it formulates and carries out fixed policies in national and international affairs. In this it differs from the Associated Press, which enunciates no policies and merely supplies a news service to a clientele of member newspapers which represent every shade of political thought and practice.

The mainspring in the Scripps-Howard organization is its debonair and dynamic Chairman, Mr. Roy Howard, a newspaperman of the old school who has come up from the ranks. He is the Monsieur Beaucaire of newspaperdom to-day, and he is a good reporter. Mr. Howard has recently completed a tour of Japan, Manchuria and China and the views he has expressed lately, not only are in remarkable contrast with opinions published in his newspapers last year, but they reflect clearly a changing viewpoint in the United States with regard to affairs in the Far East. And this altered viewpoint that Mr. Howard voices is echoed in leading American newspapers not allied with the Scripps-Howard organization, and by other great American editorial leaders, notably, Mr. William Randolph Hearst. Briefly, this new-born opinion is that the United States should cease futile and trouble-making criticisms of Japan and begin to co-operate in a friendly spirit with the Island Empire. This is the doctrine that *The Far Eastern Review* has preached for more than a decade.

Opinions about Far Eastern affairs that were broadcast last year from editorial offices of the Scripps-Howard newspapers were most bitterly resented in Japan where it was believed that the whole force of the influence of these powerful newspapers had been turned against Nippon. In the course of his stay in Tokyo last June Mr. Howard sought to explain that this was a mistaken belief. In a frank talk to newspapermen before he sailed for America he said he believed that newspapers both in Japan and in the United States had been careless in the past and he blamed the press of his own country as much, or more than that of Japan for jingoistic utterances.

"Both Japanese and American newspaper editors," he asserted, "have a very important and a very delicate duty to perform if our two countries are to co-operate for the peace of the Pacific and of the world. I feel very keenly that we have both made mistakes in the past and that these mistakes must be rectified."

Mr. Howard insisted in this talk that the criticisms of Japan through the past two years following the Manchurian incident, from his own newspapers and from other American newspapers, in fact, were not criticisms of Japan at all. He went on to explain this attitude.

"The section of the press which engaged in this criticism, including our own newspapers—the Scripps-Howard group—were interested in only one thing, the preservation of the machinery which had been created for prevention of war including the Kellogg Pact, the Covenant of the League of Nations and the Washington Conference treaties.

"Many American newspaper editors, including myself believed that in the decade between 1920 and 1930 very real progress had been made toward establishing machinery which would make wars impossible. We knew that the United States went into the World War purely on a basis of humanitarian idealism, and on the basis of two slogans: that the great struggle was a 'War to End War,' and a 'War to Make the World Safe for Democracy.' The idealism which caused the United States to enter the World War and to refuse to take any territory or other reward as a result of the victory of the Allied Powers in that war, persisted after the Treaty of Versailles and the other peace agreements were signed.

"The Great War proved to us that no war can be profitable; that all wars are utterly bad and destructive. Hence we participated in the program for the construction of machinery to make future wars impossible. I believe the United States made a mistake when it did not join the League of Nations and the fact we did not join undoubtedly weakened that organization. However, we did take the lead in calling the Washington Conference, designed to preserve peace in the Pacific, and we did take the leadership in putting forward the Kellogg Pact and other instruments for peace.

"I regret greatly to say that this machinery for the preservation of peace seems not to have been entirely successful. That being the case, Japan, the United States, and the other nations must look for new methods to preserve peace.

"The press can play a great part in the search for these methods by following a policy of friendship, toleration, and moderation. I think that American newspapers must avoid unfounded suspicion of Japan and that we must make a greater effort to understand the Japanese viewpoints in an atmosphere of a desire for friendly co-operation. And I hope that Japanese newspapers will follow the same policy. I hope they will refrain from printing inflammatory rumors about the United States and about American companies and institutions and that they will make an effort to state only facts (of course the unpleasant as well as the pleasant facts) and that they will present these facts in a spirit of friendship and with an effort at sympathetic understanding.

"Throughout my stay in Japan, Manchuria and China, I have tried to look at every situation just as the Japanese, the Manchus, or the Chinese are looking at them. I find this enabled me to obtain a more sympathetic viewpoint. And I hope that my colleagues of the Japanese press will try to adopt the same attitude when they are judging the actions of the United States. If you try to put yourselves in our place, and to look at the problems which confront Americans just as the American people themselves are looking at them, I think you can avoid many misunderstandings."

The publisher said he believed the present tendency toward naval construction in the United States will be continued until the American navy has been built up to treaty strength. He said, however, that this program is in no sense aimed at Japan any more than at European countries.

"The present world situation," he continued, "is so uncertain that it would be foolish for the American people to let their navy retrograde to a point where it is inadequate for defence. I hope Japan will not misunderstand or misinterpret American naval news during the coming year and will realize that the American people simply feel that, the machinery for peace having received at least a temporary set-back, the United States must revert for the time being to the old program of being ready to defend herself with her naval strength if necessary.

"I am firmly convinced that the traditional friendly relations existing between Japan and the United States rest primarily on economic ties. The United States is the best customer of Japan in the entire world, buying the greatest part of the Japanese export silk, as well as many other commodities, while Japan in turn depends to a great extent on the United States for her supplies of raw cotton and in addition buys many other American materials. This commerce between Japan and the United States is so important that neither nation can afford to do anything which might endanger it."

A Statement to the American Public

In a statement addressed particularly to the American people Mr. Howard on his arrival at San Francisco amplified views he had voiced in Japan and in blunt phrasing he set forth the impressions he had received in the course of his tour of the Far East. This statement, which was given special prominence in hundreds of American newspapers, is significant as it may be taken to indicate the future editorial program of the powerful Scripps-Howard newspapers. "Intelligent co-operation rather than blind competition," in Japanese-American relations is the program his country should follow, Mr. Howard believes. This statement in part follows:

"In Manchoukuo Japan has created another Alsace-Lorraine, from which she will never be ousted except by force of arms. China realizes that she will receive no aid from the League of Nations or the United States in getting back Manchuria, and that she will only recover the 'lost province' when she has an army equal to the task.

"Any thought that may have been formerly entertained by liberals that the anti-war machinery set up in Washington and Geneva might ultimately restore China's 'territorial and administrative integrity' likewise has vanished. Bluntly, these facts mean that for more than a decade American effort and progress toward outlawing war have ended in failure—temporarily, at least.

"The events of the past two years have demonstrated that as far as the Far East is concerned, America's efforts to substitute reason for force in international disagreements were premature. Since the world obviously is not prepared to outlaw Japan for what is branded as treaty violation in Manchuria, and since Japan and

the United States must continue to occupy the opposite sides of the Pacific, common sense demands a workable program. . . . . .

"America faces the alternative of continuing indefinitely to make futile protest against Japan's program in Manchoukuo, or of recognizing that other nations less content than ourselves with their present territorial boundaries are not yet prepared to accept foreign concepts of idealism when they clash with their nationalistic interests. Until world opinion becomes more unanimous, all that remains of the American anti-war program is to argue the practical advantages of our idealism, instead of offering it as an ultimatum. We can have faith in the world's ultimate abandonment of the use of force, but meanwhile we cannot sit and sulk.

"The Japanese are one nation to which American statesmanship should be devoting its most serious consideration. Upon the intelligence, tact and farsightedness of this consideration hinges the peace of the Pacific. That peace is endangered to-day. Japan knows it. We should know it. The question of who is responsible for the situation is not as important as what is going to be done about it.

No Cause for Discord

"There never has been less cause for disagreement between Japan and America than there is to-day. Never has the need for good will and co-operation been so obvious. Never have the suicidal certainties of conflict been so apparent. But logic and reason do not prevent wars. The army completely dominates the present Japanese Government. It is strongly supported by all factions except a small, thoroughly cowed and inarticulate liberal group. The army has convinced the people that Japanese statesmen have been repeatedly out-traded in the international conferences designed to preserve peace and the *status quo*.

"The myth has been cleverly built up that the United States is chiefly responsible for thwarting Japan's ambitions. The more serious part of the Japanese public is convinced that America, inclining to pacifism in consequence of female suffrage, is facing military impotence due to the clamor for tax reduction. The Japanese believe that in the desire for tax reduction lies America's real affection for naval reductions. The Japanese public is convinced that America is too penurious to fight, in which misconception lies the real danger. The gravity of this is tempered only by the fact that it results from differing psychology rather than from the clashing of fundamentals.

"In the meantime, in the interest of arriving at a new working agreement. . . . the United States should, however belatedly, make a reasonable effort to give evidence of the admiration and respect that the American people as whole entertain for the Japanese. A good start would be to repeal the unjustifiable and trouble-breeding exclusion act, substituting a law admitting Japanese into the United States on the quota basis.

"We should more intelligently picture to both nations the importance of their existing trade relations to the prosperity of each. Since it is obvious that there can be no peaceful restoration of Manchuria to China, the United States might, if approval were assured, send a commission to ascertain what our future course there should be. We should recognize Russia immediately, not only in the interest of our trade, but for a better balancing of the Far Eastern situation.

"This might conceivably be the first step in a general policy of recognizing established, functioning governments without concerning ourselves too greatly about their accidents of birth, at least until the rest of the world gives evidence of equal concern.

"Such a policy might have a decided bearing on our future attitude toward Manchoukuo.

"Finally, we should immediately commence building our navy up to the treaty quota—which could not be regarded by any nation as other than a logical result of the collapse of the anti-war and disarmament programs. That the astutest politicians of Japan are as sincerely desirous of peace as America, there is no doubt. Building our navy up to the treaty quota will give no offense to these men.

"On the contrary, such action, dispelling the idea that America has gone pacifist, would be recognized as insurance against any unfortunate "incident' which might be precipitated by short-sighted, though nonetheless highly patriotic, militarists. Our efforts toward arms reduction, even including the gesture involved in our underbuilding our navy, have been completely misunderstood in Japan. It is possible we are to blame. If to-day's situation teaches anything it is that, at least in the Far East, might still makes right and anti-war and disarmament proposals will receive a hearing only when advanced by nations which have demonstrated their ability and willingness to arm as long as civilization's greatest stupidity makes it a necessity to do so. As long as Japan believes that America is unwilling to arm to the treaty quota, she will continue to be unwilling to scale down her armament. Once she sees America is willing to build up to the treaty quota—and beyond if the world wants to remove that limit—a different psychology may develop in that land with which we must one day be in intelligent co-operation rather than in blind competition."

* * *

In line with the views of the head of the Scripps-Howard organization and giving further evidence of the changed attitude of the American people toward conditions in the Far East is an editorial published in *The Chicago Tribune* of June 18 in which a plea is put forward for "the restoration of common sense in American foreign policy." The text of this timely editorial expression is as follows:

The Rising Sun

Six weeks ago a Tokyo dispatch reported that the Japanese government had decided to revive Port Arthur as naval base. It would be strange if it did not. Strategically this base closes the Gulf of Chihli and guards the communications of the Japanese with north China. It adds importantly to her facilities for control of the Chinese sea coast down to Shanghai. After the war with Russia Port Arthur sank into ostensible insignificance, but the progress of Japanese expansion was certain to bring it to the fore as an important link in the chain of Japanese control.

The development of Japan as a great world power, largely dominating the situation in the Far East, seems to us inevitable. No other power or practicable group of powers will arrest it, though international pressures and perhaps internal complications will in various degrees restrain it. This we believe is realized in European foreign offices. The protests of the American state department under Mr. Stimson were given lip service in Downing Street and even the Quai d'Orsay for obvious diplomatic reasons, but the British and French governments were not in a situation to employ force, while Mr. Stimson was relying upon "world opinion." The Japanese government was fully aware of the moment. The time to check its enterprise was at its inception, and the only way to check it was by the application of force, which no nation or group of nations had any intention of resorting to. Only an incorrigible dreamer will expect the facts accomplished in Manchuria and north China to be undone by any proceeding of the so-called machinery of world peace. Compromises, concessions or trades will be worked out in due time, but Japan is on the Asiatic mainland to stay.

Japan is also in her mandated islands to stay. She has been developing "commercial" bases, but they are potential and intentional naval bases. They lie athwart the approach to Asia from the east.

This evolution should be understood in America. It is epochal. It cannot be conjured away by diplomatic magic of the Stimson variety. At and since the Washington conference we have progressively diminished our ability to exercise ponderable influence upon events in the Pacific by surrendering our right to develop bases essential to sea power in the Pacific and by allowing our naval power to fall rapidly in strength. We are being shut off from Asia and, short of a war to regain what we have voluntarily given up, a war we have no intention to make, we shall have to surrender all hope of obtaining a substantial share of the profits of trade and development in the Far East or rely upon making the best arrangements we can, alone or in co-operation with other powers, with the dominant power of Japan.

It is bootless to reflect that if the Chinese had not wasted their strength in internecine wars and if we had not followed the course we adopted at the Washington conference our situation would be very different. As it is, our opportunity to assist in the modernization of China and to extend our commerce in the Far East will depend more and more upon the will of Japan. We do not assert that in the long run this is the worse alternative. There are substantial factors for the support of friendly and mutually profitable relations with Japan. America is her best market and Japan is one of our best. If our policy comes down out of cloudland and shapes

itself by realities, co-operation and mutual exchange of benefits can be established, provided, of course, Japanese policy is equally rational. War between us would be insane, while the constant friction arising from our futile experiments in international monitorship is removable by the restoration of common sense to American foreign policy.

We do not doubt that there will be active competition for commercial advantages, in which Japan will play her hand for all it is worth, and it will be a hand, we think, stronger as time goes on. All the more reason, therefore, that this contest shall take place within a frame of mutual understanding and friendliness. These marked our relations for many years and the friction of recent years is not unavoidable, given the will to peace and reasonable compromise on both sides. This will need cultivating, with due regard to the self respect of both nations. At present sentiment in both countries, and especially in Japan, is not what it should be, but the causes of distrust and resentment are removable by wise statesmanship. The maintenance and development of peaceful relations between Japan and the United States are of more importance to the welfare of both countries and to the peace of the world than almost any, perhaps than any, other objective in the statesmanship of either nation.

* * *

William Randolph Hearst's Views

Last spring the Editor of the Japanese newspaper *Yomiuri Shimbun* of Tokyo addressed a letter to William Randolph Hearst and in this he asked that outstanding leader of American thought to give his views on "any important questions still unsettled between the United States and Japan." The views asked for are set forth succinctly in the communication that Mr Hearst sent in reply, and it is to be seen that these views are in consonance with the beliefs of Mr. Howard and those of *The Chicago Tribune*. Mr. Hearst's letter follows :

SAN SIMEON (Cal.), May 22—

Mr. YASUO FUWA,

Answering your kind letter :—

It seems to me that there are no important differences between the Government of Japan and the Government of the United States.

I would say, too, that there are absolutely no unfriendly sentiments among the people of the United States towards the people of Japan.

There is, to be sure, a regret that the differences between Japan and China should have resulted in war and a fear that such wars may spread and again involve other nations in a world war.

But I would say that the best way to keep these wars from spreading is for other nations to keep out of them.

Moreover, it is difficult for distant nations to determine accurately and justly the causes of the war.

There is, to my mind, at the base of this war, more than the conflict between a militarist nation and a pacifist one. There is, fundamentally, the conflict between a progressive nation and a reactionary one.

There must be something essentially antiquated or impractical in the ideals and methods of a nation of three hundred million people if they cannot sustain their ideals and practices in peaceful competition or warlike conflict with a nation of sixty million.

It is the first duty of any nation to defend, and to be able to defend its ideals and its institutions, and if China or the United States or any nation falls short in this prime obligation to society and civilization, it must take the bitter consequences.

Pacifism is not always a virtue. It is sometimes an indication of the lack of vigor and virtue. It is too often an evidence of spiritual deterioration and national decay.

Progress through the ages has been made by those peoples who have been willing to lay down their lives for their ideals.

WILLIAM RANDOLPH HEARST.

* * *

It is not only in editorial sanctums in America that the foreign policy of the United States toward Far Eastern affairs lately has been brought under sharp scrutiny. The course of editorial thought is finding parallels in the writings of intellectual leaders. John Bassett Moore, Professor of International Law and Diplomacy of Columbia University, and from 1921 to 1928 Judge of the Permanent Court of International Justice, has published an arresting article, " An Appeal to Reason," in the July number of *Foreign Affairs*. This is a challenge to loose thinking of recent years that should engage the interest of any American. Portions of this article, pertinent here, are given below :

" The thought of armed intervention by the United States in Manchuria, while glaringly inconsistent with the recent vote to abandon the Philippines, inevitably suggests the possible failure of its object as well as other serious consequences. Should the attempt to occupy the territory be successful, the perplexing questions whether to hold and administer it, or to turn it over to China, as she would naturally wish, or to some other Power, or to set up an international government, would necessarily have to be determined. Article 35 of the General Act of Berlin of February 26, 1885, relating to protectorates on the coast of Africa, recognized 'the obligation to insure the establishment of authority in the regions occupied by them .... sufficient to protect existing rights, and, the case arising, freedom of trade and of transit on the conditions that they may have agreed upon,' and this obligation was pronounced by the highest authorities to be based also on 'the nature of the case.' Where efficient local government does not exist, the total failure of our trial some years ago of international government in little Samoa indicates that of all kinds of government the international is the worst.

" The phrase 'open door' is often used in a fighting sense, although war might necessitate the door's temporary closure. The 'open door' means trade, but, of course, not in the highly obnoxious sense of 'free trade,' although a very moderate conventional tariff has long been imposed on China. For 1932 the figures of United States trade with China and Japan are as follows : Exports to China $56,171,000, imports from China $26,176,000 ; exports to Japan $134,537,384, imports from Japan $134,011,311. Without undertaking now to suggest what our final attitude towards the new state of Manchoukuo should be, I am bound to say that the proposal of permanent 'non-recognition' too vividly recalls the uncertainty and failure, and the disorder, local and international which attended the recent trial of that futile and domoralizing process as a means of preventing revolution or other unconstitutional acts in other lands.

" In 1919 President Wilson did not submit to the Senate a tripartite treaty he had signed at Paris to guarantee the eastern frontier of France, although in the long run internal order is maintained on both sides of the Rhine. Many examples, including the war of thirty years ago between Russia and Japan and the unended conflicts that have since occurred, show what a quagmire Manchuria offers for the swallowing up of blood and treasure without permanent and uncontested reward to those who take their chances in it. The much vaunted annihilation of space and time has not yet enabled a nation thousands of miles away to exert its military power as effectively as it may do at home or in its immediate environment. For a distant nation to take the chances of armed intervention in Manchuria, unless in pursuit or defense of a vital interest, would suggest a recklessness savoring of monomania.

Our Birthright

" Washington, in his farewell address, said :

" Against the insidious wiles of foreign influence, I conjure you to believe me, fellow-citizens the jealousy of a free people ought to be constantly awake, since history and experience prove that foreign influence is one of the most baneful foes of republican government. . . . The great rule of conduct for us, in regard to foreign nations, is, in extending our commercial relations, to have with them as little political connexion as possible. . . . Europe has a set of primary interests which to us have none, or a very remote relation. Hence she must be engaged in frequent controversies, the causes of which are essentially foreign to our interests. . . . Why quit our own to stand upon foreign ground ? Why, by interweaving our destiny with that of any part of Europe, entangle our peace and prosperity in the toils of European ambition, rivalship, interest, humor, or caprice ?

" The original draft of this admonition was made by Alexander Hamilton who, like Washington himself, was born a British subject ; but their minds embraced the entire world.

" Jefferson, not forgetting the Declaration of Independence which he drew, warned his countrymen that their form of

govern ment exposed them more than any other to ' the insidious intrigues and pestilent influences of foreign nations,' and that nothing but an inflexible neutrality could preserve us. Their mutual jealousies and their complicated alliances were, he said, all foreign to us. They were nations of eternal war. His motto therefore was : ' Peace, commerce and honest friendship with all nations—entangling alliances with none.'

" Sagacious John Adams, who spent many years in Europe and signed our first treaty with Holland as well as the treaty with Great Britain acknowledging our independence, when a European diplomatist remarked that he seemed to be afraid of being made the tool of the Powers of Europe, exclaimed, ' Indeed I am' ; and when asked ' What Powers ? ' replied ' All of them.' And he added :

"It is obvious that all the Powers of Europe will be continually manoeuvering with us to work us into their real or imaginary balances of power. They will all wish to make of us a make-weight candle, when they are weighing out their pounds. Indeed, it is not surprising ; for we shall very often, if not always, be able to turn the scale. But I think it ought to be our rule not to meddle ; and that of all the Powers of Europe, not to desire us, or perhaps, even to permit us, to interfere, if they can help it.

" Nothing more profoundly true was ever said ; and this was fully recognized by all our national administrations and by our greatest statesmen down to twenty years ago, when, to the disturbance of our interests and our happiness, we began to swing on the trapeze at international political performances and even to pay for the privilege of so doing.

" Not long ago a callow stripling, when I mentioned the name of George Washington, curtly remarked that his ideas were out of date and unsuited to the modern world. This is an essential postulate of the shallow dupes who, prating of our having lately become a ' World Power,' urge that we blindly don an imported livery of ' world service,' to be paid for, on demand, in unestimated instalments of blood and treasure. But it is a sad day when the children of a nation are taught to prattle ignorant and perverted slights of the men who, with steady and skilful hands, laid the foundations of its greatness and prosperity ; men to whom, by reason of their exemplary valor, integrity and wisdom, and understanding world has awarded the highest place among the immortals. Thomas Jefferson, who spoke with the authority of an intimate official association, and with an intelligence that embraced all times and all climes, declared that in elevation of character, in sureness of judgment, in firmness of purpose, in inflexible justice and in scrupulous obedience to the laws, civil and military, throughout his whole career, Washington furnished an example unparalleled in history. Jefferson himself stands before the world as a great political genius, whose ideas still stir men's minds. Alexander Hamilton, soldier, jurist, great administrator, of whom Webster said that ' he touched the dead corpse of Public Credit, and it sprung upon its feet,' is still studied as a profound political theorist, at home and abroad. And what of Benjamin Franklin, discoverer, inventor, philosopher, consummate diplomatist, at home in all lands, of whom Charles Phillips eloquently said that his fame would revive the hopes of men in ages yet to come ?

" Such are the men whom our vaporers, of current sublimities would shelve as fossils in our museums of natural history, on the hasty supposition that by various modern devices, by which men may more rapidly and more frequently communicate, and more quickly hurt or help one another, discordant races and peoples have been harmoniously united in thought and in action and in brotherly love. Where congeniality is lacking, propinquity does not tend to create affection ; on the contrary, it tends to breed hatreds. Where are to-day the danger spots of the world ? They are coterminous countries. The French and the Germans have for centuries lived side by side. No artificial device is needed to enable them quickly to come into contact. The thin line of their common frontier can instantly be strided. For ages they have crossed and re-crossed it in peace and in war ; and yet, how much have they learned to love one another ? Their recent fierce and desperate conflict, and the unappeased sorrows and resentments by which it was followed, will be accepted as a conclusive answer, except by those who would employ processes of peace that would cause the echoes of war daily to haunt the fireside. The times must be out of joint when a warlike ardor for peace depreciates the glory that was Greece and the grandeur that was Rome ; when new and untried visions are held superior to the proved philosophies of Plato and Aristotle, of Cicero and Seneca, of Bacon and John Locke ; and when the wisdom of great statesmen, heard with reverence only twenty years ago, is suddenly rejected as having no current value.

" We hear much to-day of the duties of the United States as a ' World Power,' and the supposition seems widely to prevail that we have only lately reached that eminence. But the United States has always been a World Power. It acted as a World Power when, on the outbreak of the wars growing out of the French Revolution, its first President, George Washington, with Thomas Jefferson as his Secretary of State, proclaimed our neutrality. It acted as a World Power when, some years later, it suppressed the activities of the Barbary pirates. It acted as a World Power when, in 1812, it went to war in defense of neutral rights and the freedom of the seas. It acted as a World Power when it proclaimed the Monroe Doctrine. It acted as a World Power in extending its trade and opening up foreign countries to its commerce, as it so effectually did by peaceful processes during the presidency of General Andrew Jackson. It acted as a World Power when it refused to permit the intervention of foreign nations in our civil war. It acted as a World Power when it forbade the further maintenance of the European empire set up in Mexico by French arms during our civil war. It acted as a World Power when, in the administration of President Grant, with Hamilton Fish as his Secretary of State, it brought about, through the greatest of all international arbitrations, the amicable settlement of the Alabama Claims, and in so doing made a signal contribution to the further development of the law of neutrality.

" It is useless to continue the specification of instances. Nations, like individuals may increase their power by combining with a due attention to their own business the extension of their friendly offices to brethren in trouble, and by conserving their militant resources for occasions when their vital interests are at stake. A nation that undertakes to meddle with every foreign disturbance is bound to become an international nuisance, to its own detriment as well as to the annoyance of other countries. Power is neither gained nor kept by such methods. Although megalomania may be sincere, it is noted for its mistakes."

Magnesium Manufacture in Japan

Considerable progress is being made in the Far East with regard to the production of metallic aluminium and metallic magnesium. In Japan deposits of the usual aluminium ores do not exist in any appreciable quantity, but an attempt is being made to utilize clay and alunite which is abundant in Korea.

It is reported that actual manufacturing operations are shortly to be commenced by the Japan Nitrogen Fertiliser Co. and the Showa Fertiliser Co., but details of the process which will be employed have not been revealed. This development, however, is of immense importance to Japan, where imports of manufactured aluminium metal amount to about 11,000 tons per year, supplies coming chiefly from the United States.

Raw magnesite for the production of magnesium is obtained in Manchuria, and great hopes are entertained with regard to a wider utilization of this metal in the form of light metal alloys. A magnesium plant is already working at Kashiwazaki, where the process adopted is based on the electrolysis of a fused mixture of magnesium chloride and potassium chloride. Here a novel method for preparing the magnesium chloride is in operation. Very dilute chlorine gas from the electrolytic cells is passed through milk of magnesia, which is obtained by lixiviating calcined magnesite with water. In the presence of a suitable amount of cobalt salt the formation of hypochloride and chlorate is prevented, and calcium, manganese, iron and silica which accompany the raw magnesite are thereby precipitated whilst comparatively pure magnesium chloride remains in solution and can be recovered as the crystalline salt.

This crystalline salt is subsequently fused to give the anhydrous salt, ready for charging into the electrolytic cells. Another scheme, studied in the Tokyo Imperial Industrial Laboratory, aims to prepare anhydrous magnesium chloride in a dry way by passing chlorine and carbon monoxide on the heated mixture of carbon and calcined magnesite. A third attempt is being made to recover magnesium and potassium from waste brine or bittern obtained in those districts where solar evaporation is practised on a large scale for the production of common salt.—*Chemical Age.*

The Will of the People of Manchoukuo

By GEORGE BRONSON REA

THE Commission of Enquiry of the League of Nations evidently based its conclusions regarding the independence of Manchoukuo on secret conversations with individuals whose names they are pledged not to divulge, and on the strength of 1,500 miscellaneous letters of doubtful origin, ignoring fundamental conditions which fully justify any people in resorting to extremes to assert their right to live as free men. Against these unconfirmed private letters and confidential talks with unknown people, the Government of Manchoukuo present 586 authentic telegrams, appeals and declarations from nearly every representative public body in Manchoukuo, addressed direct to the League or to the proper Manchoukuo authorities for transmission to the League. These unimpeachable documents, reflecting the indignation of the people of Manchoukuo over the conclusions of the Commission, cannot lightly be set aside. They stand in the records as a protest against any decision that denies their right to self-determination.

In a statement communicated (under date of Geneva, December 27, 1932) to the Secretary-General of the League signed by Dr. V. K. Wellington Koo, the Chinese Delegate, devotes two pages (11-12) to a typical dissertation on " Fabricating the will of the People of Manchuria," basing his charges on the contents of an alleged telegram from General Su Ping-wen, describing how the Manchoukuo and Japanese authorities were " forcing " the people to write letters to the League certifying to their desire for independence.

The Government of Manchoukuo merely invites attention to the evidence set forth in the Report and Supplementary Documents of the Commission of Enquiry as to conditions in Manchuria. With this record before the world and the conclusion arrived at by the Commission that a return to the *status quo* will not solve the problem, the Chinese Delegates are seemingly determined that the voice and wishes of the people of Manchoukuo shall not be heard in Geneva. The emissary of Chang Hsueh-liang, attached to the League Commission as Chinese Assessor, could not conceal from this body the evidence of his master's misrule and, as his Delegate to the League, moved heaven and earth to invalidate further proofs or testimony that tended to strengthen the Report and make impossible the restoration of the old regime.

The common people of Manchoukuo, ignorant of the existence of the League and the part it is playing in shaping the destinies of the world, could not be expected spontaneously to appeal to that body without solicitation and instruction. It is only natural that the Report and conclusions of the Commission of Enquiry should have been communicated to them and that they should be told how much depended upon their voluntary response to the implications of that Report. In a country where ninety-five per cent of the people are illiterate, where even if they could read, there is no public press to enlighten them, it was the bounden duty of the authorities to bring this Report to their attention by specially appointed delegates. The procedure adopted to enlighten the people on the Report and its conclusions was the same as the methods employed in any modern self-governing state, in urging the people to take an interest in legislation that vitally affects their welfare. It is safe to state that no bill is presented to the American Congress that is not supported by thousands of telegrams and letters reflecting the attitude of the people toward that particular legislation. In nearly every instance this reaction comes from pressure exerted upon the voters by their congressmen, senators, public bodies and the press. That similar methods were employed in educating the people of Manchoukuo to a sense of their responsibilities, reflects no discredit upon their response.

A Questionable Source

The Government of Manchoukuo invites attention to the fact that the letter communicated to the League dated November 19, 1932, emanated from a Manchoukuo rebel general, paid by Chang Hsueh-liang to start a revolt and create the impression that the people welcomed his return to power, and whose conception of warfare consisted in seizing the persons of some three hundred defenseless Japanese men, women and children and holding them as hostages in order to assure his band against certain annihilation, while he bargained for a cash ransom. Since then, this " defender of the people's rights " has broken through the Soviet lines at Manchuli and accepted internment rather than face the Manchoukuo and Japanese troops in honorable combat. Testimony from such sources must be valued accordingly.

To characterize as " fraudulent " and as having been " extracted by compulsion " the spontaneous and free expressions of the people of Manchoukuo as communicated through their representative public bodies and their regularly elected spokesman, is to place in question the reliability and authenticity of many similar documents filed by the Chinese Delegation in support of its own claims.

The Government of Manchoukuo takes the reasonable position that the League Commission of Enquiry came to Manchuria merely to investigate and report on conditions as they found them. Its duties were in every way analogous to that of the Prosecuting Attorney's Office in collecting and sifting the evidence in order to present a case to the Court of the Council of the League. To admit the Commission's evidence and conclusions as a final judgment from which there is no appeal, without permitting the defendant an opportunity to speak in rebuttal, is contrary to all conception of human justice, a revival to Star Chamber methods that the League was organized to abolish.

If the League desires to render full justice, why not try the methods of Solomon? China hysterically vociferates that the baby belongs to her. The child denies the parentage. It says that China kidnapped it when its parents were too weak to resist. It says China then appropriated its rich heritage and beat it, maltreated it and starved it. The " kind-hearted foster parent " drove it out to hard labor and gave it pretty pieces of colored paper with nice pictures and nursery rhymes printed on them to encourage them to work still harder. China then took the product of their toil, sold it for hard cash and put it into her pocket. China is now trying to tell the world what a wonderful, kind mother she has been. The child is of age and quite competent to take care of itself. It appeals to the same logic and justice which recognized the right of legitimate offsprings of their Mother Countries to break away and set up as independent concerns and whose delegates are now seated in the Assembly of the League as representatives of free peoples.

The Commission's Difficulty

The League Commission and the Chinese Assessor complain somewhat feelingly about the treatment accorded the latter during his visit to Manchoukuo. These plaints, however, fail to mention that the Manchoukuo authorities officially objected to the presence of a Chinese Assessor, who had come into possession of important property holdings in Manchuria, and officiated as the right-hand man and adviser of their oppressor, Chang Hsueh-liang. They had information that he came to spy on them, to intimidate and suborn witnesses and to stir up trouble. The distinguished Chairman of the Commission, however, declined to enter Manchoukuo without Dr. Koo and his associates, so the Government of Manchoukuo very properly safeguarded itself against their intrigues and activities.

The people of Manchoukuo had declared their independence. The movement was not a comic opera produced by the Japanese, but a grim tragedy—how grim, only those who have lived long in China can appreciate. The life of every man who had declared in favor of independence was at stake. The experience of the League Commission in Manchoukuo was no different from what they would have encountered in any other country under similar circumstances. It was difficult, if not impossible, for the Commission to ascertain accurately the wishes of the people, short of a plebiscite which, under the conditions prevailing, was impracticable. It took an American

army to supervise an election in a Central American Republic, in order to register the wishes of its people. There are still many parts of the civilized world where the will of the people cannot be ascertained even under the most carefully supervised and elaborate system of balloting. It would not be difficult to cite instances in the most advanced democracies where bribery, force, suppression and even armed interference determine the voice of the people. It is only necessary to refer to the Wood-Forbes Report on Conditions in the Philippines (1921) to demonstrate how difficult it is to determine the wishes of a people towards independence. The following extract from that Report conveys its own story :

"Too often there has been a marked disinclination on the part of individuals, especially Filipinos not in sympathy with immediate or absolute independence, to state their opinion openly, for the reason that they feared loss of standing or persecution if they did so. Their fears were very genuine and, unhappily, there is evidence that their apprehensions were well-grounded."

It was the same in Manchuria. The fears of the people that the Chang regime would return to power and their lives and properties would be forfeit, were very real indeed. Now that the people understand that their old tyrant will not be permitted to return to power, they have no fear for their future. They can openly and freely express their wishes. This they have done and their will is fully recorded in the documents now in possession of the League.

The League's Task

AFTER compiling a historical review of modern Chinese history and delivering itself of a set of recommendations for the solution of the Manchurian problem, the Report of the League Commission of Enquiry terminates with the following conditions, which had it been stated in the opening paragraph, would have rendered superfluous all the contradictions and inaccuracies which followed :

"**Since the present political instability in China is an obstacle to friendship with Japan and an anxiety to the rest of the world (as the maintenance of peace in the Far East is a matter of international concern) and since the conditions enumerated above cannot be fulfilled without a strong Central Government in China, the final requisite for a satisfactory solution is temporary international co-operation in the internal reconstruction of China, as suggested by the late Dr. Sun Yat-sen**"...."**All other claims of her newly awakened nationalism—legitimate and urgent though they may be—should be subordinated to this one dominating need for the effective internal reconstruction of the State.**"

A strong Central Government, however, is impossible unless adequate means of communications are created that will enable it to enforce and maintain its authority. Recognizing this, the Report says on Page 19 :

"**In connection with the problems of maintaining law and order, the present inadequate means of communications in China is a serious handicap. Unless communications are sufficient to ensure prompt transportation of national forces, the safeguarding of law and order must largely, if not completely, be entrusted to provincial authorities, who, on account of the distance of the Central Government, must be allowed to use their own judgment in handling provincial affairs....The danger of civil war must continue to exist so long as the Central Government lacks the material means to make its authority swiftly and permanently felt all over the country.**"

Page 24 : "**China has not at the moment the capital nor the trained specialists necessary for the unaided accomplishment of her national reconstruction . . . Along this road of international co-operation, China would make the surest and most rapid progress towards the attainment of her national ideals, and such a policy would make it easier for foreign Powers to give what support the Central Government may seek, and to help in the removal as rapidly and effectively as possible of any causes of friction which may endanger her peaceful relations with the rest of the world.**"

Stripped of superfluous verbiage, the Report says that without an adequate system of railways, a strong Central Government cannot exist or function in China. This is no new or startling conclusion.

Since 1911, the Publisher of *The Far Eastern Review* has recognized this basic need for the reconstruction of China and has devoted his personal time and the influence of this magazine to the furtherance of various schemes designed to realize this objective. As adviser to Dr. Sun Yat-sen in 1912-13, to Yuan Shih-kai in 1914, as Technical Secretary to the Chinese Delegation to the Paris Peace Conference and as Deputy of Mr. Sun Fo in 1929, he drafted plans for a national system of railways for China designed to establish and consolidate the power of the Central Government over the whole country. In addition, he was entrusted by Dr. Sun Yat-sen, President Yuan Shih-kai and Minister Sun Fo with the task of conducting negotiations with foreign governments and bankers for financing these lines.

Any one of these schemes could have succeeded and a strong Central Chinese Government set up had the Powers been as deeply solicitous for the welfare of China as they were in advancing their own special and selfish interests. It is needless at this late date to explain in detail why these various plans fell through. They are recalled merely to emphasize that various Chinese Governments on their own initiative have honestly endeavored to solve their problems in this manner and were thwarted by international jealousies and the instability of American policy.

The question arises : would a new international group, operating as the instrument of the League, be more successful in financing China than the old Consortium ? Would the guarantee of the League to an issue of Chinese Government bonds, become a greater attraction to investors than that of the Four Consortium Powers ?

Something like $400,000,000 of so-called League loans are now in default, and to all appeals for help from the creditors, the League answers that it will exert every moral suasion possible upon the defaulting nations to pay up.

Would the American Government surrender the principle underlying the Consortium and co-operate with any new instrument devised by the League to supplant it ? International co-operation in the reorganization of China, is now possible only through America's recognition of the League's leadership and its ability to guarantee and protect such a huge investment.

Twenty years ago, when Dr. Sun Yat-sen first attempted to solve the communications problems of his country by international co-operation, ten thousand miles of railway would have cost to construct and equip, approximately half a billion gold dollars. To-day, the cost would be about the same. Where are these huge loans to come from ? What security has China to offer ? What guarantee exists that the loans will be repaid ? Who is to supervise their expenditure ? Who will direct the operation of the lines ? Who will protect them against Communist and bandit raids or prevent the military from taking them over as they have every other railway in China ?

If the League can provide the necessary safeguards and guarantee for these huge loans, it may solve the problem of China, but it will never reconstruct the Country by creating jobs for "Experts" who lack the power to finance or enforce their recommendations. Not until the whole machinery of government is placed under international control can the evils which have wrecked a civilization be corrected.—G.B.R.

The Harp With One String

This from *The Japan Chronicle:*

WE learn from the *Manchuria Daily News* that Mr. George Bronson Rea is back again in Manchuria, but is about to proceed to Washington, where he will represent Manchoukuo officially so far as Manchoukuo is concerned but unofficially, or not at all, so far as the United States is concerned. The Dairen paper disrespectfully calls this sort of representation bootleg diplomacy. Of this representative it further says.

> Mr. George Bronson Rea is one of the veterans in Asian adviserships, as he was closely connected with many Chinese leaders for some thirty years. He was known throughout the East as a forceful writer in the *Far Eastern Review*, which he publishes.

Long ago he used to give his Chinese friends quite different advice from what he gives now. His strong card in these days is the Li-Lobanoff Treaty, the existence of which, he says, gave Japan a clear right to annex Manchuria. He has kept on saying this so often and so constantly that he believes it himself now, though it is rather futile since it is too late now to act upon such an argument. As for Mr. Rea being a forceful writer, perhaps "noisy" would describe his peculiar style better. He conveys the impression of a man talking very loudly.

* * *

Long ago, *The Far Eastern Review* was edited by a brilliant and versatile Australian, who during the Great War became the head of the Chinese official publicity and intelligence office. He also acted as correspondent for many newspapers in America, Europe and throughout the Far East, amongst which was the then *Kobe Chronicle*. The laison between the two British-edited publications was very intimate; the *Chronicle* receiving its inside news about Chinese politics direct from the head of the Chinese propaganda office at Peking and *The Far Eastern Review's* editorial policy towards Japan was largely influenced by the anti-Japanese news-factory in Naniwamachi. This mutual admiration society ceased to operate when, on his discharge from the army, the American Publisher of this magazine refused to permit its columns to be used for carrying propaganda that was leading his country into a war with Japan. Since 1920, the editor of *The Japan Chronicle* sees Red when he reads an article signed by George Bronson Rea.

As to that secret Li-Lobanoff Treaty of Alliance between China and Russia it is hardly to be expected that an editor whose spiritual home is somewhere in the shadow of the Kremlin would admit the legal aspects of a situation created by the secrecy surrounding the existence of that pact. It may be true that it is now too late to act upon such an argument. Bludgeoned in 1895, buncoed in 1905 and bluffed in 1921 out of their legitimate fruits of victory; caught fast in a treaty trap while China was depriving them of their hard-won rights and investments in Manchuria and menaced by the rapid spread of Communism which threatened to engulf the Far East, the Japanese army has corrected the errors of a too liberal and too trusting diplomacy. But that does not alter the facts or invalidate Japan's claims should she decide to fall back on her position created by China's confession in 1921.

The State of California has recently ordered a new trial for a convict who has served eighteen years of a life sentence for bomb-throwing. His friends—and we imagine that the editor of *The Japan Chronicle* is numbered amongst them—have been busy all these years collecting new evidence and influencing public opinion to bring pressure to bear upon the authorities to reopen the case. Facts are therefore never futile. It is never too late to act upon evidence that changes an unjust verdict into a just one. Suppression of evidence through a conspiracy of silence where the life of a nation is concerned is just as despicable as sending a human-being to the gallows by the same process.

It may be too late to invoke the secret Li-Lobanoff Treaty of Alliance in support of Japan's rights and position in Manchuria. Convinced that any appeal based on China's confession would receive little consideration the Japanese Government has abandoned the legalities of its case by recognizing the independence of Manchoukuo. The world condemned Japan on the findings of a hastily written League Report which, after admitting the existence of the secret treaty, ignored its consequences. But Facts are Facts. They cannot lightly be set aside. History will accuse in its day.

This will also be another "noisy" statement, jarring to the nerves of our Kobe contemporary, but it has to be loud, and emphatic in order to drown out the wave of vituperation, invective and abuse broadcast from Naniwamachi whenever any article explaining Japan's position appears in public print. Stick to the argument, Mr. Young and omit the personalities. Learn a new tune and play it on the saxaphone!

Water Power in the Dutch East Indies

There is about 6.6 million h.p. of potential water-power available in the whole of the Dutch East Indies, but it is badly distributed having regard to the requirements of the various islands, according to an article in a recent issue of the *Far Eastern Review.*

For example, Java, which is the most densely populated and the most highly developed of the islands, possesses only 60,000 h.p., the greater part of which is in West and Central Java. Of the other islands, Sumatra and Borneo each have about two million h.p., Celebes about one million, and the remainder about one million h.p. between them. All these great sources of power are practically unused at present. The Government controls the exploration survey and development of water-power, and has since 1917 concentrated them in a special Water Power and Electricity Division.

West Java is the most developed. The light and power works of Batavia and its environs, as well as the electrified railways in the Batavia district, have, since 1925, been supplied by means of a 70,000-v. line from the Government Oubroug power station on the Tjijatih river near Tjibadak; this station, which is equipped with two 5,400 kw. turbo-generators, also supplies Buitenzorg and Sukaboemi. Distribution in Batavia is entrusted to the "Ned.-Indische Gas Maatschappij," and in Buitenzorg and Sukaboemi to the "Gebeo," a mixed public electric utility company. A second power station, known as the Kratjak, on the Tjianten, with two 5,500 kw. sets, will be connected with this system in Buitenzorg. For the supply of the plateau of Bandoeng there is about 20,000 kw. of water power plant. At present the Division is engaged in constructing new transmission lines and substations, which are intended to open up new areas.

In Central Java, on the river Tuntang, is the 4,000 kw. hydro-electric Sousoukan station belonging to the Allgemeene Nederlandsch-Indische Electriciteits Maatschappij (Aniem), erected in 1913 to supply Samarang and Salatiga. The Government power station of Giringan, on the river Tjatour, near Madioun, is equipped with two 740 kw. sets, and supplies energy only to the Government railway workshops at Madioun and the municipal electrical services of that town. In East Java, with a view to supplying the provinces of Sourabaya, Kediri, and Pasuruan, the Mendalan power station, equipped with three 5,500 kw. sets was recently opened on the river Konto. It is operated by the Nederlandsch-Indische Waterkracht Exploitatie Maatschappij (Niwem), which is a combine of the Government and the "Aniem." The latter owns electrical works in this area. There are projects in preparation for the supply of power in Central and Eastern Java.

The same degree of progress has not yet been reached in the Outer Islands. Only one Government hydro-electric station has been erected, namely, the Teis plant, on the river Ketahun (Bencoolen)--about 1,500 kw.—*Eastern Engineering and Commerce.*

The Outlook in China*

Some Comments on the Opportunity for British Firms to Increase their Trade

By C. A. MIDDLETON SMITH, M.Sc., M.I.Mech.E.
(Taikoo Professor of Engineering in the University of Hongkong)

The author of this special article was educated at the Royal Naval College and the University of Birmingham, and was later an assistant engineer on the staff of Plymouth Electricity Department and of Belliss and Morcom Ltd., Birmingham. Subsequently he acted as demonstrator and lecturer at the University of Birmingham, senior demonstrator at King's College, London, and assistant professor of civil and mechanical engineering at the East London College, University of London. He has been Taikoo Professor of Engineering in the University of Hongkong since 1912. At the end of this valuable contribution Prof. Middleton Smith writes: "Let me appeal to the British manufacturer to consider the market in China. If only we could persuade the principals of firms to come out here to see the opportunities, to encourage their agents, and to find a life-long interest in this wonderful Far East, then indeed should we feel satisfied that British firms will get the bulk of the trade of the future with China."

"ASIA IS AWAKENING!" During my visit to England last year those significant words were sent forth from the London broadcasting station, and often as I glanced through newspapers and reviews they met my eyes. England, in perhaps rather a vague fashion, is beginning to realize that Asia is awakening.

Those of us who have lived in Asia know that changes are taking place rapidly. Machinery is replacing man-power. Of all the many peoples in Asia the Chinese are, from the widest point of view, particularly important. The 18 provinces of China proper—excluding Manchuria and Mongolia—may be compared in area to 18 Britains. The people of China are amazingly industrious and also intelligent, they have an authentic history of 4,000 years, and their country has vast natural resources. It is a potential market for British manufacturers of immense value.

England and the Far East are a long way apart, but in time and in thought they are far less distant than when, 21 years ago, the writer first came to Hongkong. A modern air-mail service now carries our letters. When the atmospheric conditions are favorable we listen to words broadcast from England. It is only a matter of time—perhaps only months, since scientific improvements come quickly in these days—before the British broadcast program will be heard in any part of China.

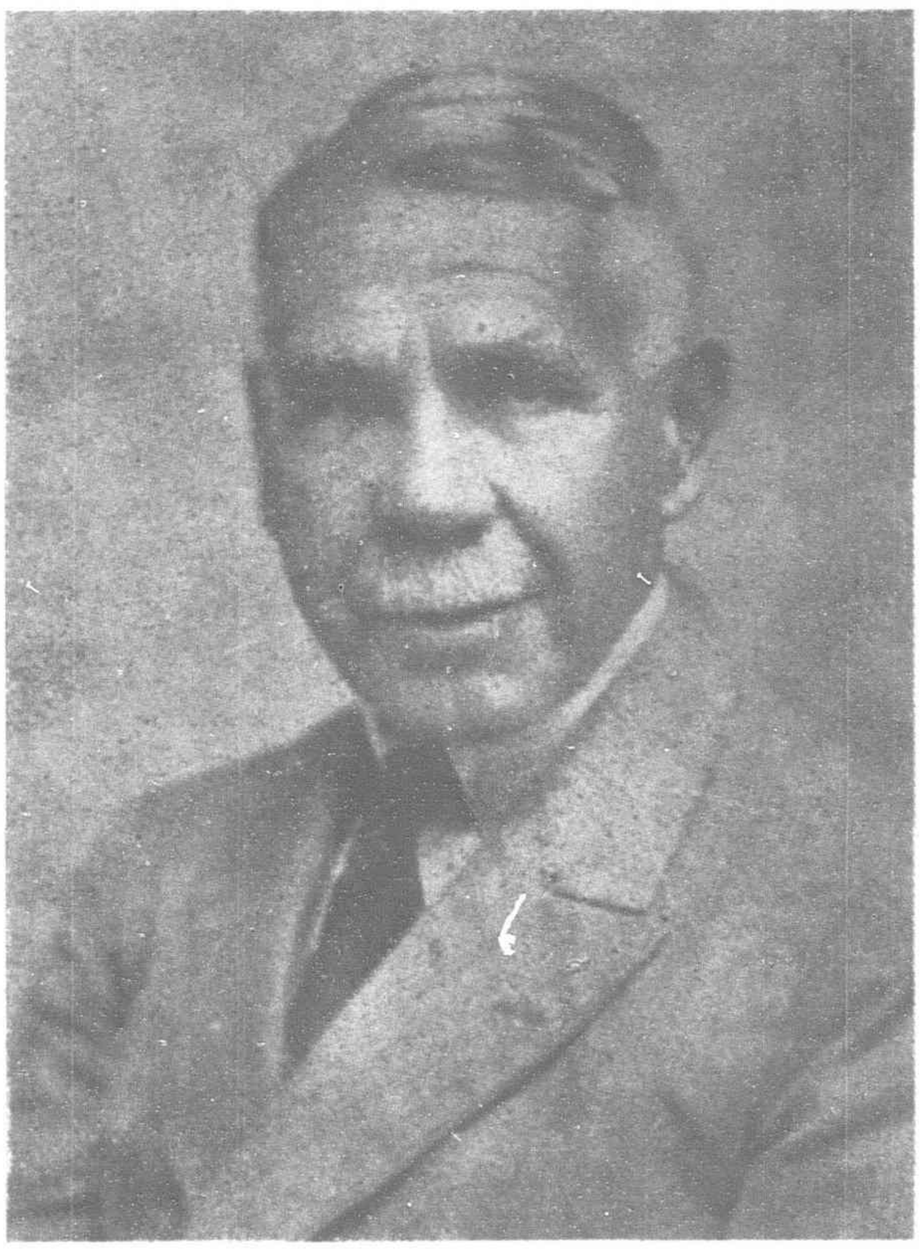
Those people who have never visited China are reminded of the country chiefly by the newspaper reports of political disturbances, the insecurity of foreigners, and the enthusiasm of missionaries. But in China there are many thousands of Anglo-Saxons who lead lives almost uneventful except for the excitement that comes to them through their life-work, which is trade.

It was the urge to trade that first sent the British to China. It was the desire to trade that prompted the British to accept, in 1841, the suggestion of Chinese officials that they should establish themselves on the then unimportant island of Hongkong. And it is Anglo-Chinese trade that has caused the colony of Hongkong to increase its population of about 5,000 in 1841 to nearly a million in 1933. It is trade that has transformed a mud-flat of 70 years ago into the amazing International Settlement of Shanghai, that now has more than a million inhabitants, with factories and skyscrapers, and an electric-supply output greater than that distributed by the civic authorities in Manchester.

Machinery is transforming China as in the past it transformed Europe. It is true that the most striking changes have come to the coast ports, but the examples to be seen in those places are gradually affecting even the most remote parts of the country. Years ago an eager Chinese student travelled six weeks by sedan-chair, river-junk, and ocean steamer to reach the goal of his ambition—the University of Hongkong. He had previously acquired a good knowledge of English and other subjects. After spending two years in a school in Hongkong, he lived for four years in the University, working among engines and electric and hydraulic machinery. He took the full course in the University workshops. He is now in the remotest—and the richest—province in China, near to the borders of Tibet. He is a missionary of applied science. He is constantly advocating the introduction of machinery. And having been trained in British standards, and knowing intimately the details of British machinery, he has a bias in favor of British products.

Mill Equipment

In days gone by the British in China created a market for cottons, woollens, and other manufactures. That market still exists, despite the increasing competition made inevitable by the mills erected in Japan, Shanghai, and Tientsin. It is certain that each year this competition will become more and more severe, the immense difference in wages making it very difficult for the British manufacturer to produce cotton goods for China at the price of Far Eastern mills. But he can obtain orders for the equipment required by the native mills.



Professor C. A. Middleton Smith

The secret of the success in trade of the "nation of shopkeepers" has been the adaptability of United Kingdom traders to new and changing conditions. The important market of the present and future in China is machinery. Will the British manufacturer of machinery win in the competition with other European countries and America? The writer is sanguine that he will.

Let us consider the advantages and disadvantages of the situation from the point of view of the British manufacturer. First of all there is the general reputation for good quality and a fair deal which the British have gained and maintained among the Chinese. It is no exaggeration to say that during the last 60 years and more, and especially to-day, the British have maintained the best reputation as a nation, and as traders, in China. That is an enormous asset.

Next, the British have a remarkable base and object lesson in this Colony of

**The British Engineers' Export Journal.*

Hongkong. This place demonstrates to the most unobservant what can be done by Anglo-Chinese co-operation. The reclamations, the docks, the wharves, the railway to Canton, the electricity-supply system, the remarkable roads (in most cases cut out of the rocky hill-sides), and the numerous industrial plants show what can be done by the application of science and machinery to conditions in China. The wealthy Chinese from the interior who visits Hongkong returns to his home no longer content with his old conditions of life. And what is perhaps more important, when he returns he leaves his sons and daughters at school in Hongkong, where they learn the English language and the rudiments of science. They live for years amid the modern luxuries—which to them soon become necessities—of motor-cars, wireless, electric heaters, cold storage, running tap-water and reinforced-concrete dwellings. Very soon they bring pressure to bear upon their parents to have the same amenities of life in their own homes. And so the Chinese are persuaded to purchase these up-to-date products of the workshops of other countries.

Again, there are some three million Chinese in Singapore, the Straits Settlements, Hongkong, and other parts of the British Empire who are British subjects, and who sometimes visit the towns or villages in China where their clan has its headquarters. And they "boost" Britain, since the Empire has given them the equal opportunities to acquire wealth and full security with justice. They appreciate those privileges.

Shipping Enterprise

When we consider the disadvantages under which British manufacturers work we can almost sum them up in four words—distance and high wages. The chief difficulty about distance is freight, and the British shipping companies are well aware of this. They have had to meet terrific competition from the state-subsidized vessels that fly the flags of other nations. Yet, in face of such tremendous odds, the old-established lines "carry on." In this connection a tribute must be paid to Messrs. Alfred Holt and Co., Ltd., of Liverpool, for their enterprise and foresight. Any suggestion for the improvement of British trade in China is not only welcomed by that firm, but promptly investigated, and in spite of trade depression one of their vessels is to be found loading or unloading in every port in China where there is accommodation for ocean steamers. And on the rivers and along the coast of China the bulk of the shipping trade goes to other vessels that fly the Red Ensign.

The wage problem is difficult. The writer is convinced that it can only be solved by Anglo-Chinese co-operation. In these days of unemployment all over the world any suggestion for replacing British labor by non-British sounds almost like treachery. But facts, however unpleasant, must be faced. Half a loaf is better than no bread, and it is better to sell the products of British factories through the agency of Chinese salesmen than not to sell them at all.

Nearly 20 years ago the writer advocated to British firms this system of training and employing young Chinese to sell their goods. Immediately the difficulties were enumerated, and make no mistake about it, there are difficulties. But, during the last five years especially, many British firms have made the experiment. The system is inevitable and it pays. That does not mean that the British will disappear in the near future from China. The executive ability and the initiative will be British. But the British must co-operate with the Chinese as regards salesmanship. The most satisfactory way of doing that is to take young Chinese, of good education, and train them in the head office or factory in Britain. It is money well invested. And in this matter the authorities of the University of Hongkong are willing to co-operate by recommending reliable graduates in engineering, commerce, etc. There are already several Hongkong University engineering graduates in works in Great Britain, in training to join the Far Eastern staff of the firm or their agents in China.

Present Difficulties

There is no desire to gloss over the difficulties created by the political chaos, and also and especially those caused by the low value of silver, in China to-day. But there has always been some sort of rebellion going on in China, and in spite of that, trade continues. It is difficult for the British to do more than attempt to conciliate the Chinese war lords. But if only a great effort were made to increase the purchasing power of the natives by improving the value of silver the result would be most valuable.

By reason of his training the writer's thoughts always turn to the application of science in China. The opportunities for the use of machinery are very great. Think of what the transformation of Hongkong has meant to British workshops. Two years ago the local cement works gave an order for a quarter of a million pounds' worth of machinery to a British firm. The colony is about to build another dam for its water-supply. That will cost over a million pounds sterling. British engineers and British machinery are employed on the work.

Graduates of the Hongkong University have built hundreds of miles of roads in South China in the last decade, on which one finds cars, buses and lorries for which British firms have obtained valuable contracts. Again, a large number of British high-compression oil-engines have been sold for use on the rivers and in rice mills. And trained men must operate them, and Chinese engineers are the best supervisors and salesmen. Mention can also be made of the valuable orders China has given Britain in recent years for aeroplanes, and in another field the machine-tool manufacturers have been wide awake and benefited.

In fact once the British exporter gives this market his attention he finds it worth while if he tackles the problem seriously. And that is why, after more than 20 years of advocacy that Chinese artisans and foremen, as well as professional engineers, must be trained, a certain advertisement in the latest newspapers makes me sanguine for British trade in China. For the Hongkong Government announce that boys of 13 years of age may enter its new technical school. There they may be trained in a manner to qualify them to become good workmen and foremen. This is another example of how the British in Hongkong try to help the manufacturer in Britain. Will the Home manufacturer co-operate and take full advantage of these opportunities? It will certainly pay him to do so.

From time to time representatives of United Kingdom engineering firms call on the writer at the University of Hongkong. They are always welcome. All of us, in the applied-science departments, are eager and anxious to see the development of the natural resources of China, the extension of communications and the spread all over the Far East of British ideas of justice and the square deal. Indeed, it is not too much to say that every Briton in China feels very much the same about these matters. You will find that the up-to-date missionaries realize that it is only through the extension of a knowledge of applied science and the extended use of machinery that reforms are possible in China.

Let me therefore appeal to the British manufacturer to consider the market in China. If only we could persuade the principals of firms to come out here to see the opportunities, to encourage their agents, and to find a life-long interest in this wonderful Far East, then indeed should we feel satisfied that British firms will get the bulk of the trade of the future with China.

Canton Cement Plant Extension

The Reconstruction Department of Canton has added another unit to the Government cement plant at Saichuen, in the western suburbs of Canton. The contract for this extension was recently made with the Danish firm F. L. Smidth and Co., which originally built the present plant now the most profitable enterprise so far undertaken by the Kwangtung Government. The additional unit calls for 1,300 barrels a day, which unit when completed will double the present capacity—namely a total daily output of 2,600 barrels.

The present consumption of cement in Kwangtung is over 5,000 barrels a day. The Honan Cement Works turns out about 700 barrels a day, so that when the Saichuen plant has doubled its capacity, there would still be a deficiency of 1,700 barrels, which would have to be imported into the province.

It is worth noting that the demand for Saichuen cement is increasing to such an extent that order from all parts of the province have been placed many weeks ahead with the Saichuen administration.

The Chinese Cotton Industry

By EISABURO KUSANO

CHINA'S cotton spinning and weaving industry was founded in 1888 by Li Hung-chang, great statesman of the Ching Dynasty, when he built the Yang-Pu-Chu, or the foreign textiles factory, in Shanghai, that year. To-day, the industry has developed into one of the most advanced and best organized of all the manufacturing activities in China.

There were, in May, 1932, all told 128 mills in China, the number including 41 Japanese and three British plants, and their combined total equipment stood at 4,904,788 spindles and 42,596 looms, according to the Chinese Cotton Millowners' Association. The foregoing total include mills in the Japanese leased territory of Kuantung and also Manchoukuo.

As regards the distribution of these mills: There were 61 in Shanghai, including 30 Japanese and three British. These correspond to 48 per cent of the aggregate total number of mills. Shanghai is indeed China's cotton industrial center. That the international metropolis is the distribution center of raw materials as well as the products, it being situated near the river mouth of the great Yangtze, is mainly responsible for its becoming the cotton industrial center.

Outside of Shanghai, the following provinces are known as the cotton industrial districts:

Kiangsu Province (not including Shanghai), 21 mills, all Chinese.

Hopeh Province, nine mills, all Chinese.

Shantung Province, eight mills, including six Japanese.

Hupeh Province, eight mills, including one Japanese.

In addition to these, there are 16 Chinese mills which are scattered in Honan, Chekiang, Anhwei, Hunan, Shansi, Hsinkiang and Shensi Provinces.

Further details of these mills as regards their productive activities, according to the report issued in July, 1932, by the Chinese Cotton Millowners' Association based on their investigations dated May, 1932, were as follows:

Items	*Chinese*	*Japanese*	*British*
No. of mills	84	41	3
No. of spindles	2,730,790	2,003,388	170,610
No. of looms	20,599	19,306	2,691
Operatives	173,687	74,440	13,000
Cotton consumed	5,411,987	3,410,905	330,000
Yarn output	1,427,919	805,979	50,000
Textile output	8,242,740	10,190,790	1,800,000

Note: 1. The unit is as follows: cotton consumption, piculs; yarn output, bales; textile output, pieces.

2. The foregoing total of 41 Japanese mills include the plants in the Japanese leased territory of Kuantung as well as those in Chinchow and Mukden, of Manchoukuo, and also one Manchoukuo mill among the Chinese total.

According to reports of the China Cotton Millowners' Association the raw cotton consumption in China in recent years was as follows:

(Unit: 1,000 bales)

Countries of origin	*1929-30*	*1930-31*	*1931-32*
U.S.A.	292	362	883
British India	463	520	421
Egypt	3	8	8
China	1,533	1,438	942
Others	6	2	—
Totals	2,297	2,329	2,254

Note: The total for Chinese cotton consumed in 1931-32 includes a small quantity of miscellaneous goods under the heading of "others."

It is worthy of special mention that the Japanese mills in China play an important rôle in the raw cotton consumption. Admitting that the number of Japanese mills is less than one half of the total Chinese mills, the former's yarn output corresponds to nearly 60 per cent of the total turned out by the Chinese mills, while the textile production is considerably larger than that of the Chinese mills. This is due entirely to the fact that most of the Chinese mills are run on small scale whereas the Japanese mills are operated on larger scale and also their efficiency as well as the machinery equipment are superior to that of the Chinese factories.

Changes Taking Place

At the Chinese spinning mills, 12s and 16s have hitherto constituted the principal products, but they are showing a tendency to spin higher counts of yarn in recent years. The Japanese mills in China, which had hitherto manufactured mainly the 20s, are consequently obliged to concentrate on the production of still higher counts of yarn.

Generally speaking, a Chinese spinning mill require from 550 to 600 operatives to run 10,000 spindles of 20s, whereas a Japanese mill in China, under identical conditions, requires 450 operatives; in Japan, 350 are sufficient. At Chinese weaving mills, one operative attends to two looms, while at Japanese weaving mills, one mill hand looks after from three to four looms; in Japan, 5.5 looms, on the average. The foregoing calculations are made on the basis of two-shift system.

As regards working conditions: a peculiar method is in practice in China. The operatives are employed through an agent called the contractor instead of their being employed directly and individually by the mills. The Chinese mill hands are employed by the contractor. The contractor supplies the mills whatever the number of operatives the management may require, and the contractor holds himself responsible for the payment of wages.

Wages paid to the Chinese spinning and weaving mill hands are the lowest in the world, and there exists no standard such as the lowest wages agreement. Their efficiency, however, does not compare with that of the mill hands of Lancashire or Japan.

Their working conditions are not favorable. The Chinese, the Japanese, and the British mills in China employ the two-shift system all alike. The Japanese and the British mills grant from 15 to 30 minutes of rest period each shift, but this is not done in the Chinese mills. In spite of the fact that the Chinese Factory Law is in effect, the limitation of working hours of women and juvenile operatives is not observed in any satisfactory manner. In the Tientsin district, among other places, juvenile operatives are employed under the apprentice system without any fixed wages paid.

It is a common phenomenon that a large number of juvenile operatives are in the employ of spinning mills in China. According to a recent report, up to 14.5 per cent of the total operatives of spinning and weaving mills in Shanghai were juvenile workers under 12 years of age, and that 80 per cent of these were female. Some of the Japanese and British mills have started movement to improve this deplorable situation, and they show a tendency to avoid employing male and female operatives of tender years. Some of the Japanese mills are even giving elementary education to juvenile workers in their employ.

It is known that the working conditions of the spinning and weaving mill hands in China are the worst in the world. Labor disputes are common in the cotton industry in China, as a result. In Shanghai, for instance, one may safely state that the dispute is going on all the year round.

Trade Movements

China is primarily a cotton goods importing country. In 1931, the import amounted to Hk. Tls. 120,000,000 against Hk. Tls. 49,000,000 for export. The export, however, is steadily increasing particularly in recent years, and the prospects are convincingly promising in sequence to the rapid development of the industry.

The total 1931 export amounting to Hk. Tls. 49,000,000 was made up of Hk. Tls. 34,000,000 cotton yarn, Hk. Tls. 12,000,000

textiles, and some other manufactures. What is most noteworthy about this is that the yarn export in 1931 was almost twice as large as that of the preceding year, and that the cotton goods export had also registered an increase by about 25 per cent. It is to be recalled, however, the export include that by foreign mills in China.

About one half the volume of export went to Hongkong, and the remainder was shipped to British India, Straits Settlements, and the Dutch East Indies. Furthermore, a major portion of the shipments to Hongkong was re-exported from there to the Oriental markets mentioned above.

The cotton spinning and weaving industry in China is thus growing into a powerful rival of that in Japan.

"Crisis" of Chinese Cotton Industry

China's cotton spinning and weaving industry had an unusually good opportunity for its substantial development at the time when the Manchurian incident broke out because it was followed by a thorough-going boycott against the Japanese industrial manufactures, not only those produced in Japan but also the products of the Japanese factories in China. And, the Chinese cotton industrialists, in full realization of the opportunity, became the moving spirit of the boycott movement, acting in concert with various other patriotic organizations. This chance notwithstanding, the Chinese cotton industry is said to be confronted with a crisis of acute nature.

In point of fact, the Chinese cotton industrialists, at their national congress held in Shanghai on March 10, 1933, decided on the curtailment of operations to five days and nights a week. This is the heaviest restriction of operation known in China.

Chinese Expert Traces Causes

And, what has brought such an acute depression to China's cotton industry? This question is fully answered by one Mr. Fang Hsien-ting, Chinese economic critic, in his article contributed to the *Ta Kung Pao*, Chinese newspaper published in Tientsin.

Mr. Fang points out that the phenomenal development that the Chinese cotton industry made during the hectic boom of World War was not on the basis of a sound foundation, and that the immediate cause of the prevailing crisis is the sharp decline of the yarn market quotations.

He explains that in the Shanghai market, at the end of March, 1933, the then prevalent quotations of 16s and 42s were lower than the 1932 level by 18 per cent and 36.6 per cent respectively. It meant, according to his calculation, that Chinese spinning mills sustained a loss of 15 taels per each bale of 16s. If a cotton spinning company capitalized at 1,500,000 taels produced annually 17,500 bales of yarn, the company was to incur a loss aggregating 262,000 taels or nearly one-fifth of its capital, a year.

Further explaining the causes that have accounted for the recent depression of the Chinese cotton industry, Mr. Fang classified them into two groups. One is called "outward" causes, and the other, "inside" causes.

The outward causes are divided into three, as follows:

(1) Civil Wars: For the past 20 years or more, there never has been a year when there were no civil wars in China. In point of fact, Szechuen, Kiangsi, Fukien, Hunan, Hupeh, and other provinces are in chaos even at present on account of internal political armed disputes and also of the Communists activities. And, there is no knowing when peace and order can be restored. The perpetual warfare has necessarily disturbed traffic and hampered the raw cotton supply to spinners and the spinners' marketing of their products in the interior parts of the country. Furthermore, the local purchasing power was invariably and directly affected wherever the civil wars were waged. Under such circumstances, the yarn stock in Shanghai accumulated to the imposing total of 200,000 bales and that in Tientsin, 40,000 bales, recently.

(2) Sino-Japanese Dispute: That the extensive market in the Three Eastern Provinces has been monopolized by the Japanese rival manufacturers as the result of the Manchurian situation is a great blow to the Chinese mills.

(3) Inability of the Government: The National Government of Nanking, which claims to be the Central Government of China, is so devoid of power that it cannot give proper protection to the Chinese cotton industry. When the Nanking Government abrogated the "likin" tax, a kind of traffic tax, the producers, by paying a certain standard tax, were to be no longer bothered by various inter-provincial taxes on their cotton yarn and textile traffic. In reality, however, it is not so. In districts where the influence of the National Government is not powerful enough, for instance, Szechuen and Canton, taxes identical in nature to likin are levied in spite of everything. Mr. Fang adds that the standard tax, too, is not appropriate to give sufficient protection to the Chinese cotton industry. According to the existing system, 2.75 yuan is collected per picul of cotton yarn of 23s and under, and 3.75 yuan on higher counts of yarn. In view of the fact that the Chinese mills produce mainly lower counts of yarn, the tax on 23s and under should be lowered, in the opinion of this Chinese author.

Other Adverse Factors

The inability of the Central Government has also brought forth the remarkable decline of raw cotton production in China, goes on Mr. Fang. Statistics show that the output reached the highest mark in 1919 when it aggregated 9,028,390 piculs, but that it has declined year after year ever since until it dropped off to 6,399,790 piculs in 1931. In consequence of the steady wane of output, China's international trade in raw cotton has also become an excess of import, although the export had long exceeded the import. In 1931, the unfavorable balance of the raw cotton trade amounted to 3,456,494 piculs valued at Hk. Tls. 132,265,699. This adverse turn of the situation necessarily constitutes a heavy burden to China's cotton industry.

In sequence to the explanation of these three major "outward" causes, Mr. Fang now proceeds to clarify the "inside" causes, and he is exceedingly severe in the analysis thereof. He says that it would require a great determination on the part of the Chinese mill owners to combat these "inside" causes of the present depression and the imminent crisis, although the three major "outward" causes are likely to be disposed of if and when civil wars come to an end, the Sino-Japanese disputes are amicably settled, and a powerful Central Government is established in China. The "inside" causes are also divided into three major factors as follows:

(1) Shortage of Capital: The Chinese mills suffer from financial difficulty at the very outset of the enterprise. As a rule, a joint stock company in China is able to call up the payment only for the first time, and there is hardly any possibility of having the entire subscribed capital being paid up, regardless of the nature of the enterprise. It is not seldom that even the first call is not completed when the factory is built and equipped by virtue of the full approval given by the Board of Directors. Now the cotton spinning industry is one of the enterprises which requires a considerable amount of fixed capital, and therefore, business management becomes more difficult than other industrial undertakings on account of the foregoing peculiar habit.

There are in Shanghai at present a number of Chinese mills which run enterprise in the "hand to mouth" fashion due simply to the acute shortage of working capital. For instance: these mills buy raw cotton with the arrangement that the price be settled 10 days afterwards. During these 10 days, they must convert the cotton into yarn, and what is more, they have to sell with a proper margin of profit. Sometimes the price of raw cotton is settled in kind with the yarn. It is only natural in the circumstances that the Shanghai mills should be forced to restrict operations from $6\frac{1}{2}$ days a week to five days.

(2) Absence of Experts: Another big defect of the Chinese cotton spinning mills is that they have neither proper business managers nor experienced technicians "who would work" instead of just sitting pretty in their offices.

Plans in Management

Almost all the machinery equipment of the Chinese mills is of foreign make and the men in charge of it "officially" are trained in Japan, England, America, or at the Chinese college specializing in the cotton industry. These technical experts, however, seldom work in the factory. They would not even look at the machinery. Everything is left to the care of mere operatives. It is next to miraculous if fine cotton yarn is produced with a reasonable margin of profit at mills under such slovenly management.

As regards the men who are in charge of the business end of the enterprise, they are still less capable and responsible, goes on

(Continued on page 383)

Railway Electrification in Japan

By W. HARVEY CLARKE, JR.

ORIGINALLY electric motor-car operation on government railways was intended to facilitate passenger traffic only in the vicinity of the metropolitan area of Tokyo, but recently such service has also been opened up in and near the industrial center of Osaka. On March 31, 1933, the total length of motor-car sections had reached 235.3 kilometers, according to Mitsuzo Furukawa, chief of the Bureau of Electrification of Japanese Government Railways.

Electric locomotives are in service along dense traffic sections of the Tokaido trunk line as well as on certain sections of the Shinetsu, Chuo and Joetsu lines, all of which have heavy grades and numerous tunnels. The total length of sections where electric locomotive trains are operated comes to 307.3 kilometers. Thus, constantly better service is being afforded to effectuate adequate transportation facilities on the government lines of Japan.

Electric Train approaching the Portal to Shimidzu Tunnel (6.03 Miles), Joetsu Line

For the electrified sections mentioned above—there being some sections where both electric motor-cars and locomotives are used—the aggregate length electrically operated is 431 kilometers, which corresponds to approximately 2.8 per cent of the total length of 15,375 kilometers of government railway lines up to March 31, 1933; whereas traffic volume under electric operation during the year 1932, was about 9.1 per cent of the total traffic volume for all government lines.

Beside the above sections, electrification of 48 kilometers between Suita and Suma on the Tokaido and Sanyo main lines, and that of 21.2 kilometers between Atami and Numazu, also on the Tokaido, is now under way.

When these sections are electrified, motor-cars will be operated on the former sections, while electric locomotives will serve the latter. A further 7.8 kilometers between Ichikawa and Funabashi on the Sobu line was electrified in April of this year.

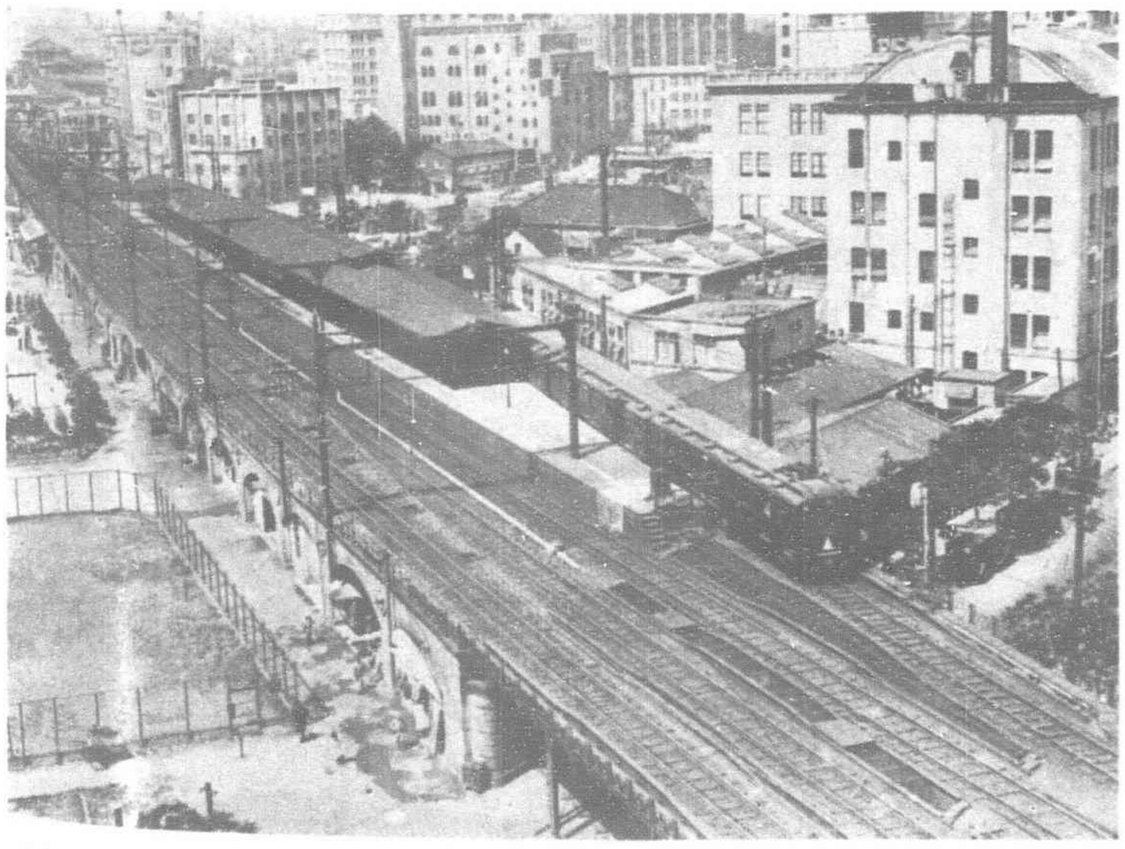
Electric Motor-cars

The first electric train service over government railroads was a single motor-car operated on a section along the Chuo line from Tokyo out to its suburbs. This line was purchased by the government from a private concern in October, 1906, when nationalization of trunk-line railways was realized. Since that time sections for motor-car operation have been extended from year to year. Electrified sections up-to-date are indicated by the table below.

SECTIONS WITH ELECTRIC MOTOR-CAR OPERATION

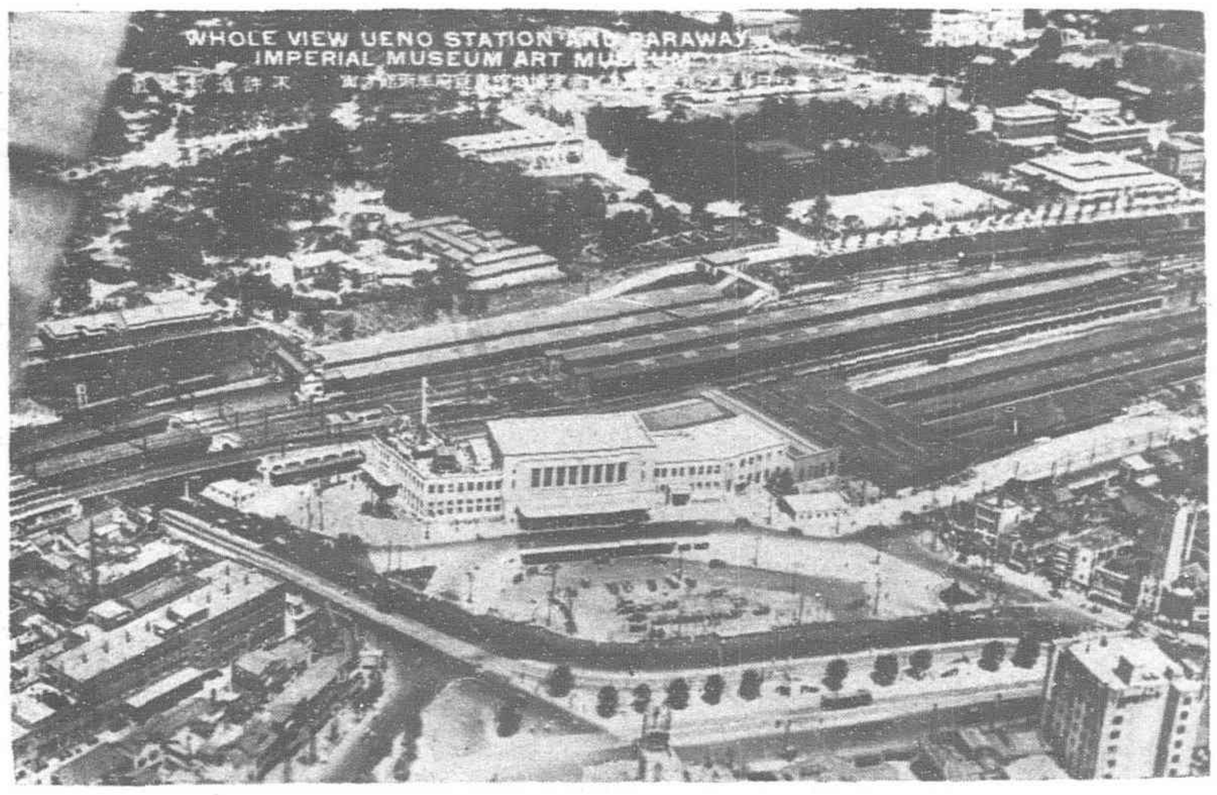
(To March 31, 1933)

Line	*Terminals of Electrification*	*Route Length (Km.)*	*Year Electrified*
Chuo	Tokyo-Asakawa..	53.1	1906-1930
Tohoku Main and Yamate	Tokyo-Omiya	56.4	1909-1932
	Shinagawa-Akabane		
	Ikebukuro-Tabata		
Tokaido Main and Branches	Tokyo-Yokosuka	86.9	1909-1932
	Higashikanagawa-Haramachida		
	Yokohama-Sakuragicho ..		
So-bu	Ochanomizu-Ichikawa	14.9	1932-1933
Katamachi	Katamachi-Shijonawate ..	13.3	1932
Johto	Osaka-Tennoji	10.7	1933

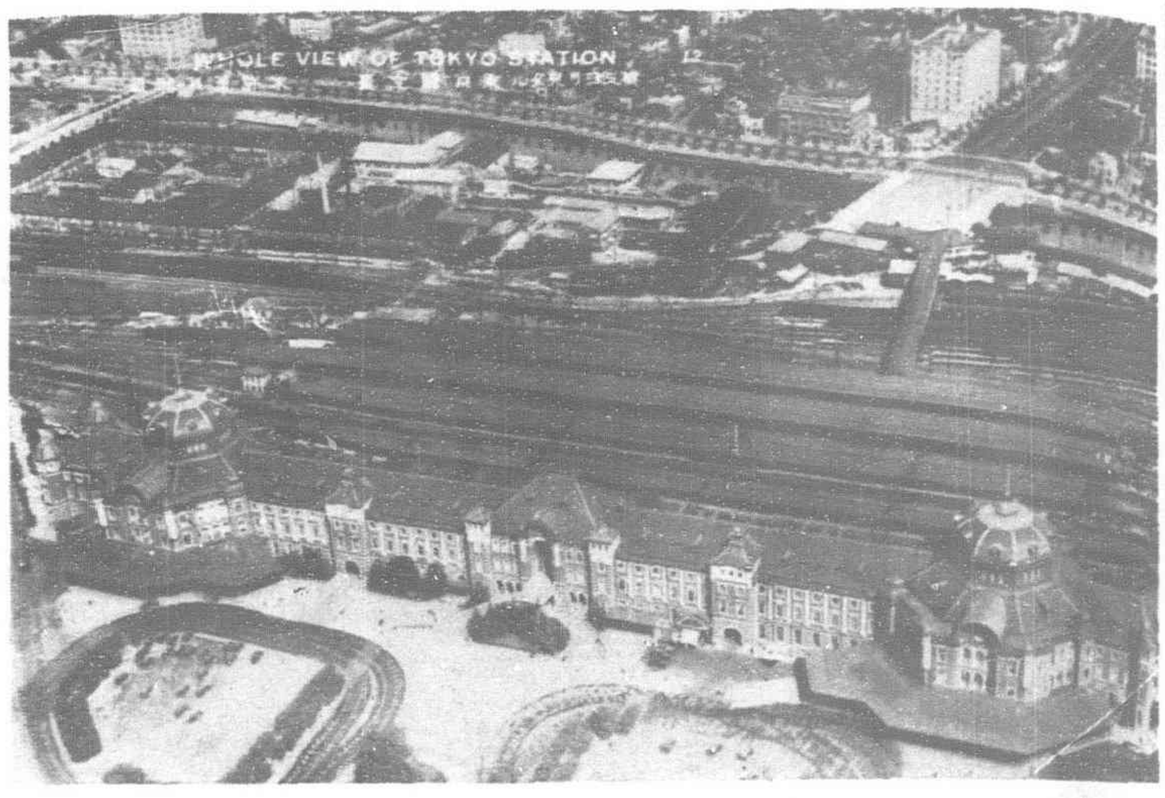


Elevated structure at Yuraku-cho station in the heart of downtown, Tokyo

Northern concourse of Tokyo Central Station with Plaza in foreground

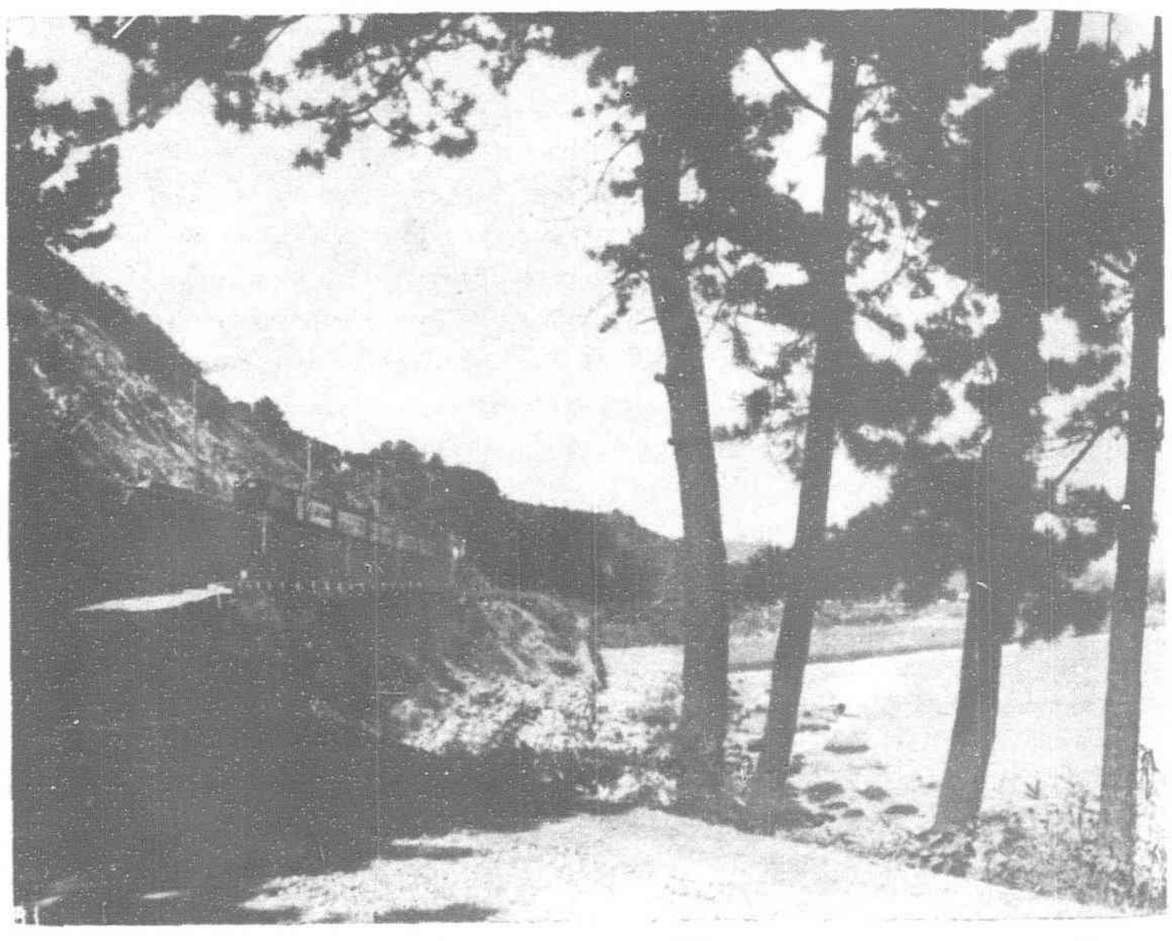


Bird's eye view of new Ueno Station and Yards

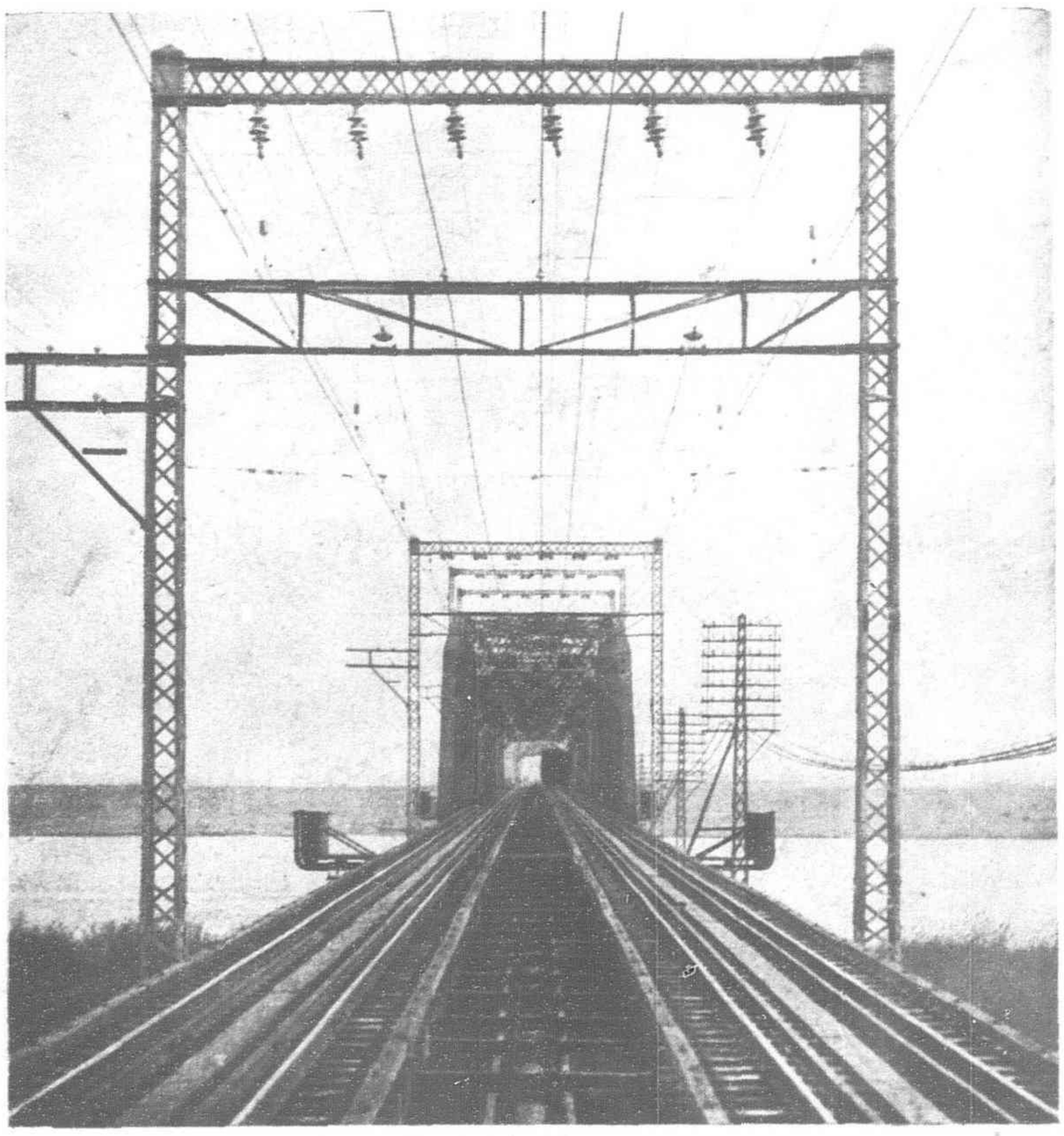


Aerial view of the Long Structure of Tokyo Central Station

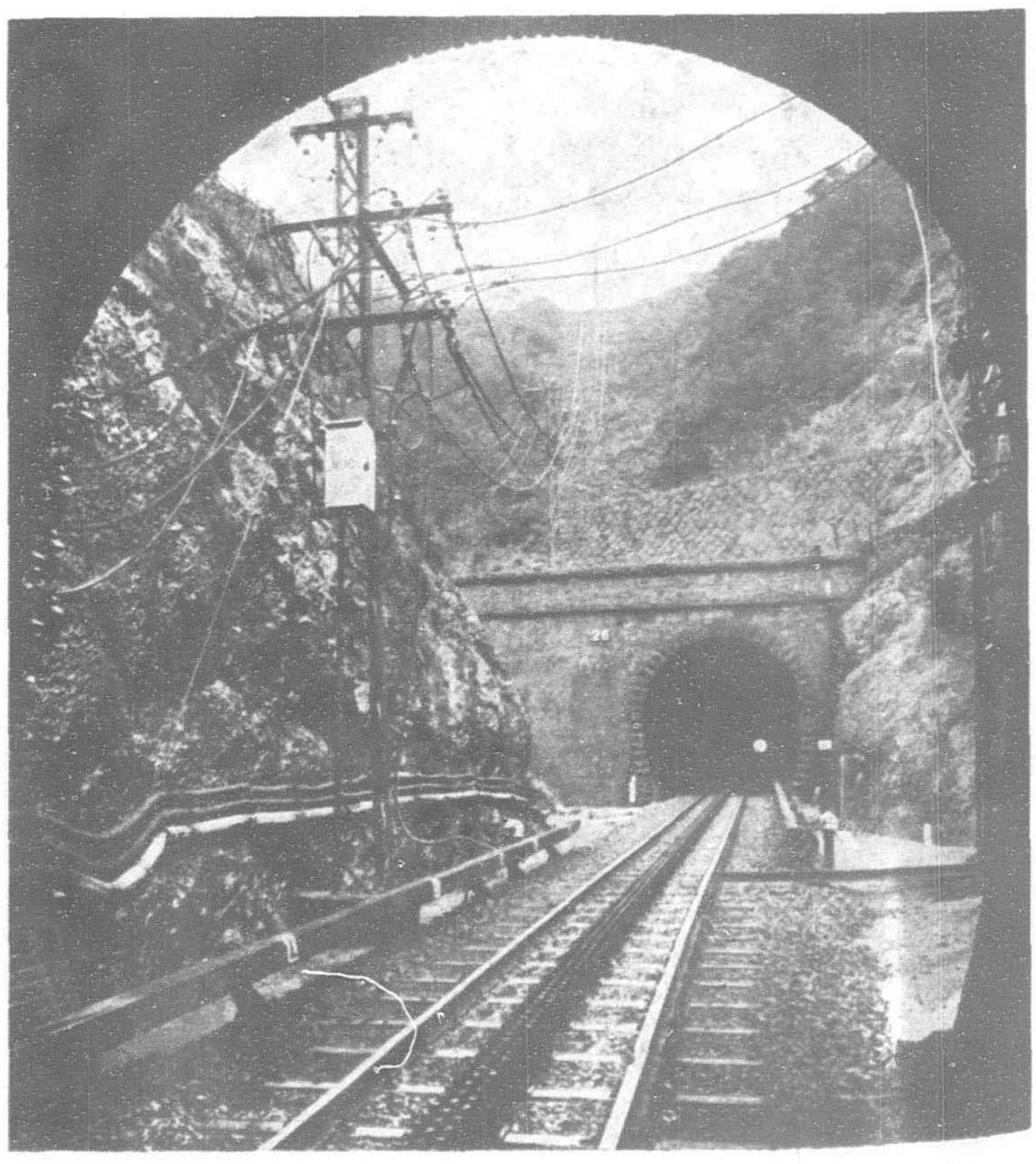
Electric Train in Usui Pass, Shinetsu Line



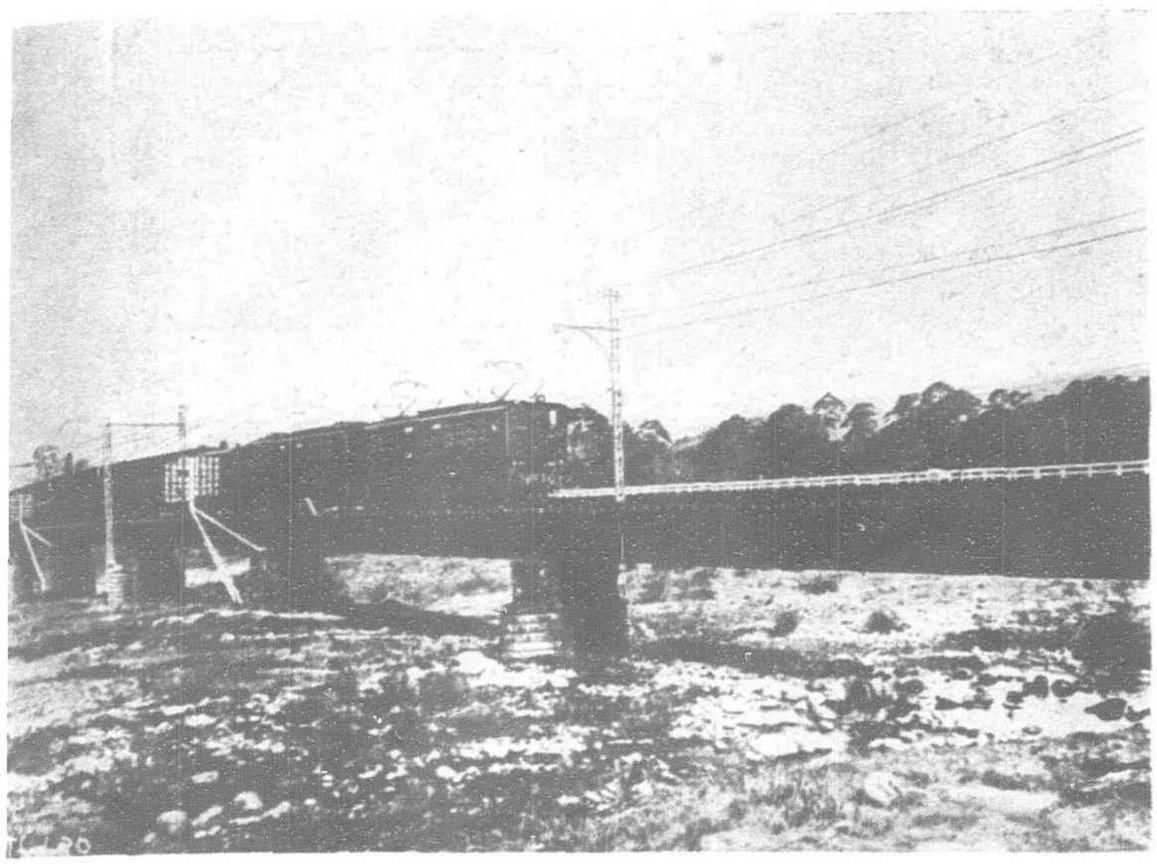
Electric Train running along Pacific Coast near Atama Spa



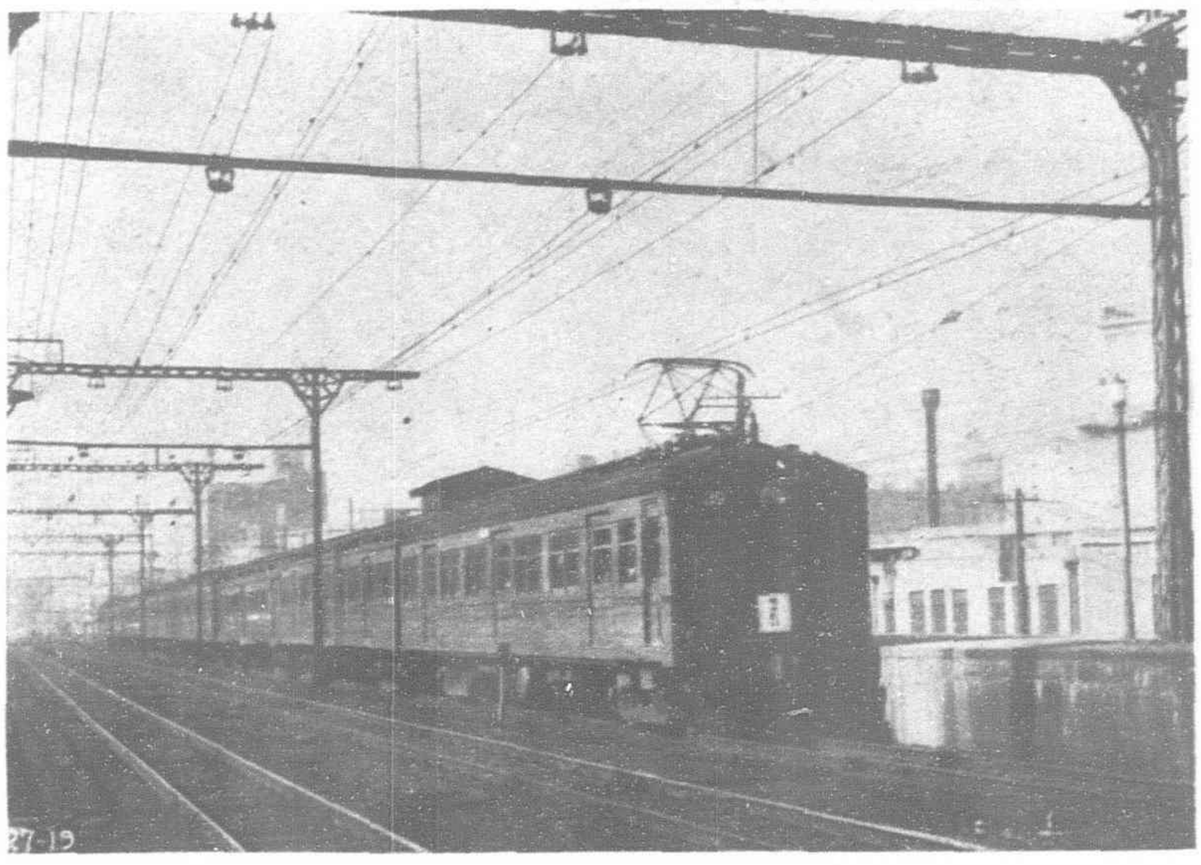
The Sobu Line where it spans the Arakawa



Third Rail System in Usui Pass, Shinetsu Line



Scene along the Chuo Electric Line



Eight-Car Electric Train leaving Tokyo Station, Tokaido Line

Operation.—Electric operation of single-car, six-minute headway service on the Chuo line was put into effect by the government. At present, however, on some sections, 8-car train service at two-minute intervals is in order during morning and evening rush hours, as shown by the above table.

A schedule speed of 25.1 kilometers an hour was maintained when motor-car operation was first effected, but resulting from increased train length and traffic volume, this speed has been stepped up as follows:

SCHEDULE SPEED

(To March 31, 1933)

Line	*Terminals of Electrification*	*Route Length (Km.)*	*Time Required (min.)*	*Schedule Speed (Km. per Hr.)*
Chuo	Tokyo-Asakawa	53.1	79	40.3
Yamate	Shinagawa-Shinjuku-Ikebukuro-Ueno-Tokyo-Shinagawa	34.5	64	32.3
Tohoku Main	Tokyo-Omiya	30.3	43	42.3
Tokaido Main line and Branch	Tokyo-Yokosuka	62.4	68	55.1
Sobu	Ochanomizu-Ichikawa ..	14.9	23	38.9
Katamachi	Katamachi-Shijonawate ..	13.3	22	36.3
Johto	Osaka-Tennoji	10.7	19	33.8

Rolling Stock.—Four-wheel, single-truck motor-cars equipped with two motors of 36 or 40 kw. each were used when the Chuo line was acquired by the government. However, these small cars were abolished gradually with the extension of electric operation. To-day bogie cars equipped with four motors of 100 or 85 kw. each are standard.

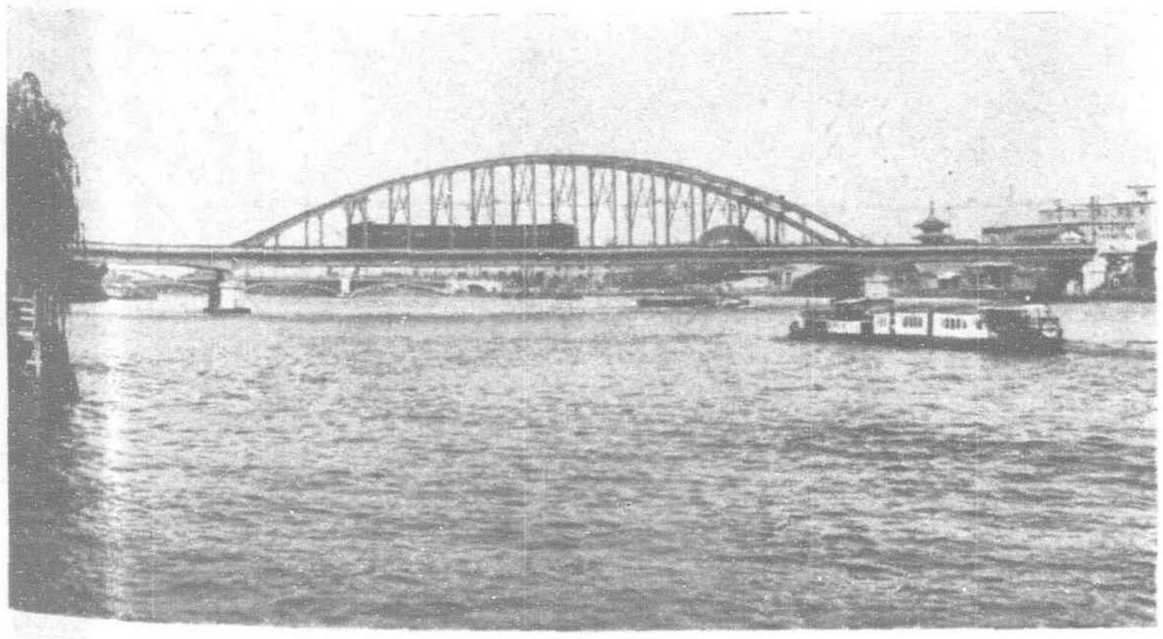
At the end of March this year the number of cars totalled 1,269, consisting of 644 motor-cars and 625 trailers, with nine electric car sheds to house them. The bodies of the cars are in large part of wood, but new ones constructed since 1926 are of semi-steel with door engines.

Two-trolley poles were employed formerly to transmit current, but in 1914 when pantograph was adopted, the single-trolley catenary system with bonded rails for return circuit was made standard.

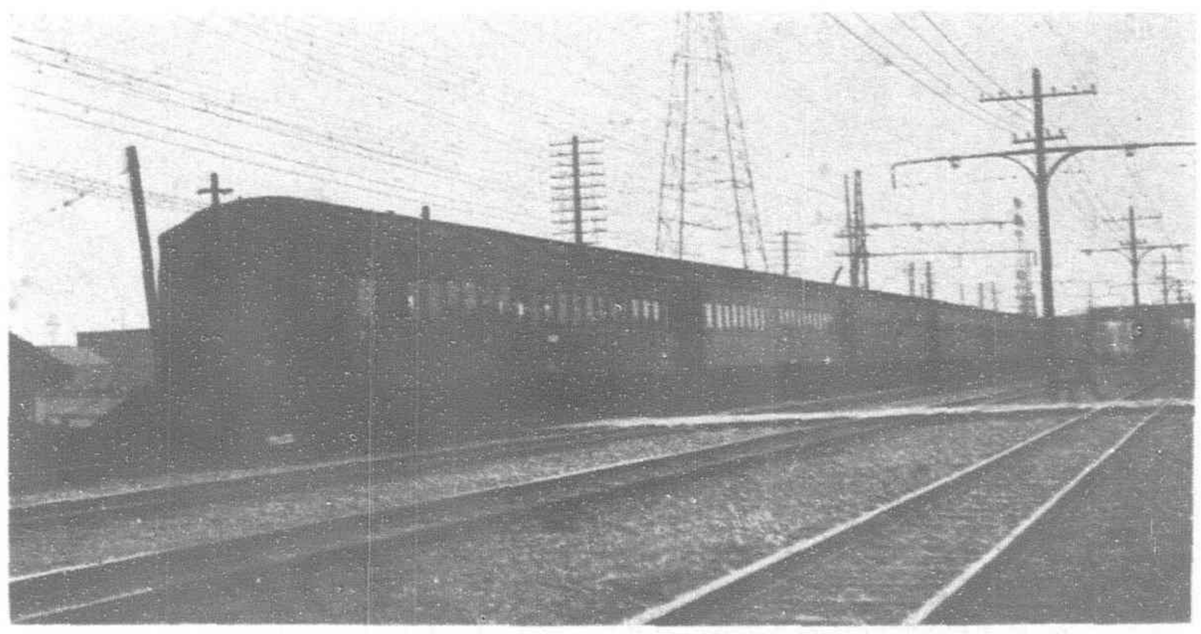
In the early days, 4-wheel, single-truck cars weighing 11.5 tons each and seating 53 passengers were in use. Now motor-cars of 32 to 45 tons in weight, seating 96 to 134 passengers and trailers weighing 20 to 33 tons and seating 92 to 134 passengers each are in service. Maximum dimensions for motor-cars or trailers are 20 meters in length, 3.75 meters in height and 2.805 meters in width.

NUMBER OF ELECTRIC CARS IN SERVICE DURING RECENT YEARS

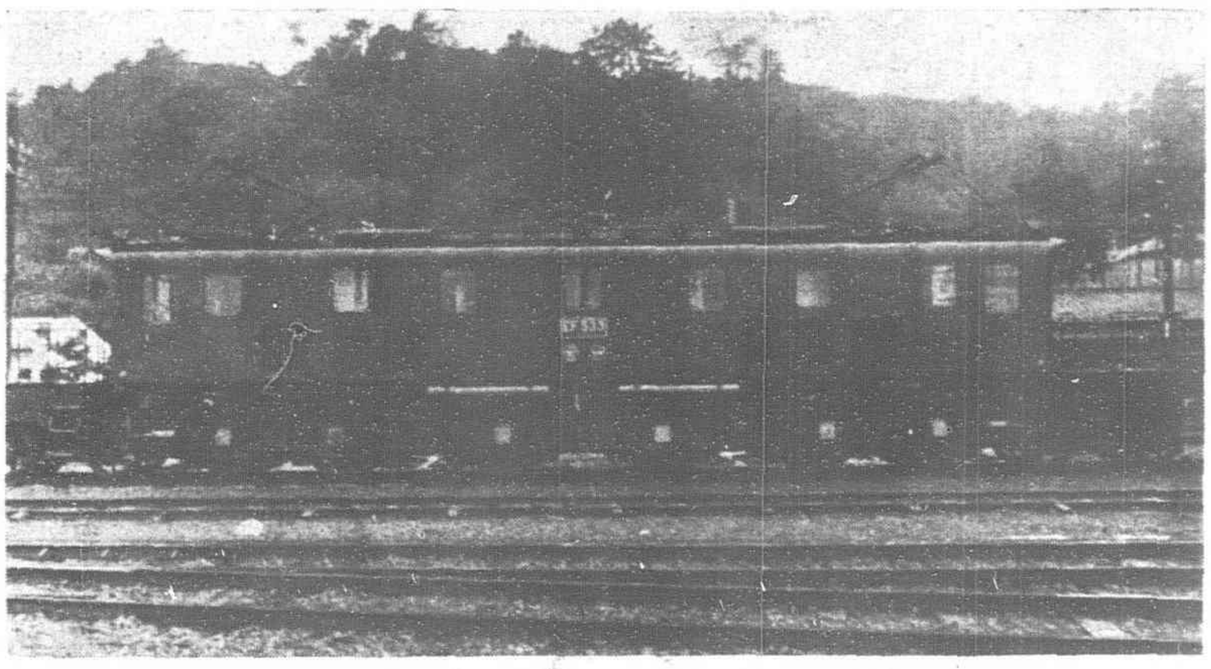
Year	*Electric cars*		*Total*
	Motor-cars	*Trailers*	
1929	539	499	1,038
1930	582	546	1,128
1931	613	606	1,219
1932	644	625	1,269



"L" Train crossing the Sumida River on New Railway Bridge completed last year for Cross-City Shuttle between Ochanomizu and Ryogoku Stations, Sobu Line

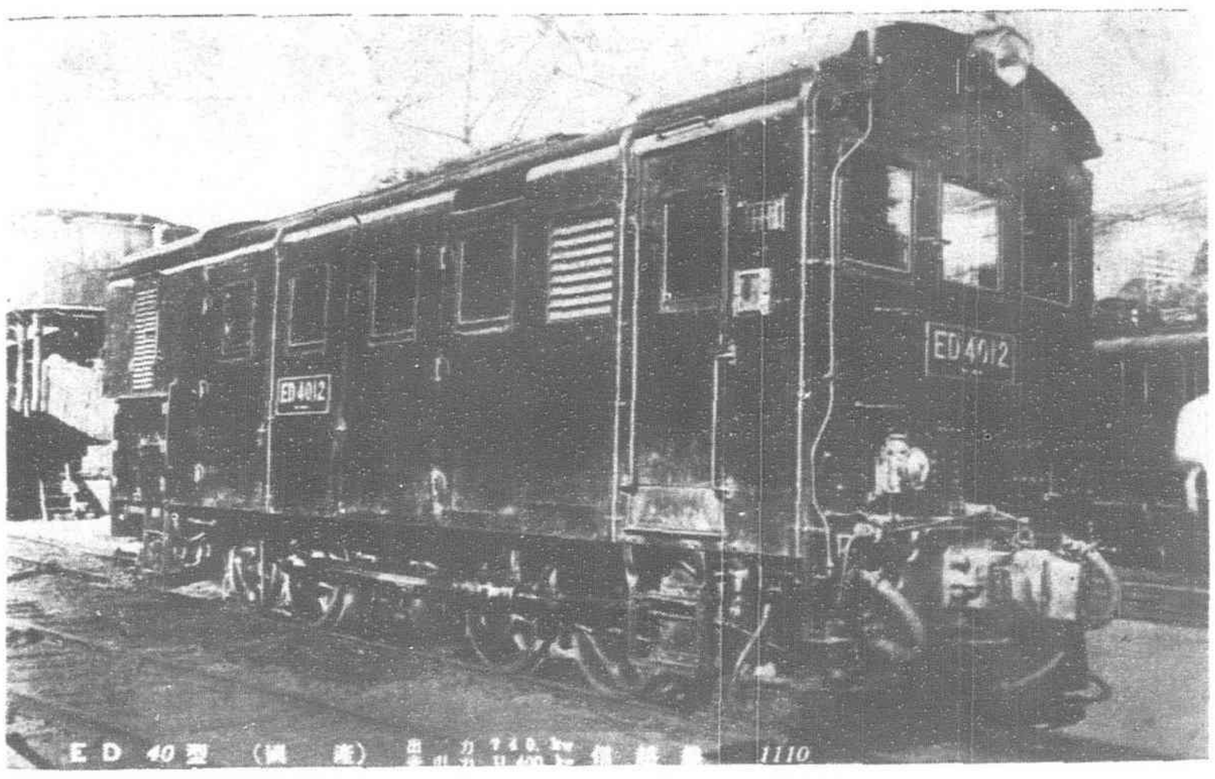


The Sakura Express Train operated along the Tokaido Trunk Line between Tokyo and Kobe

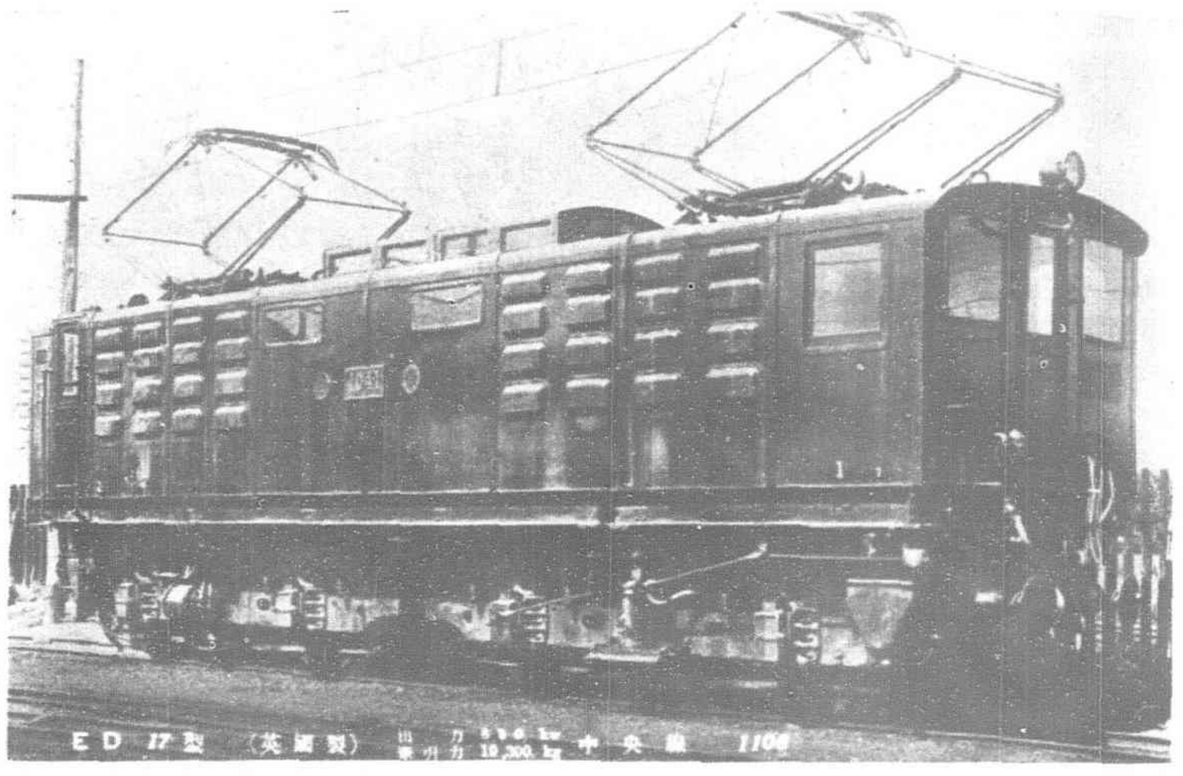


New Electric Locomotive, Type EF53

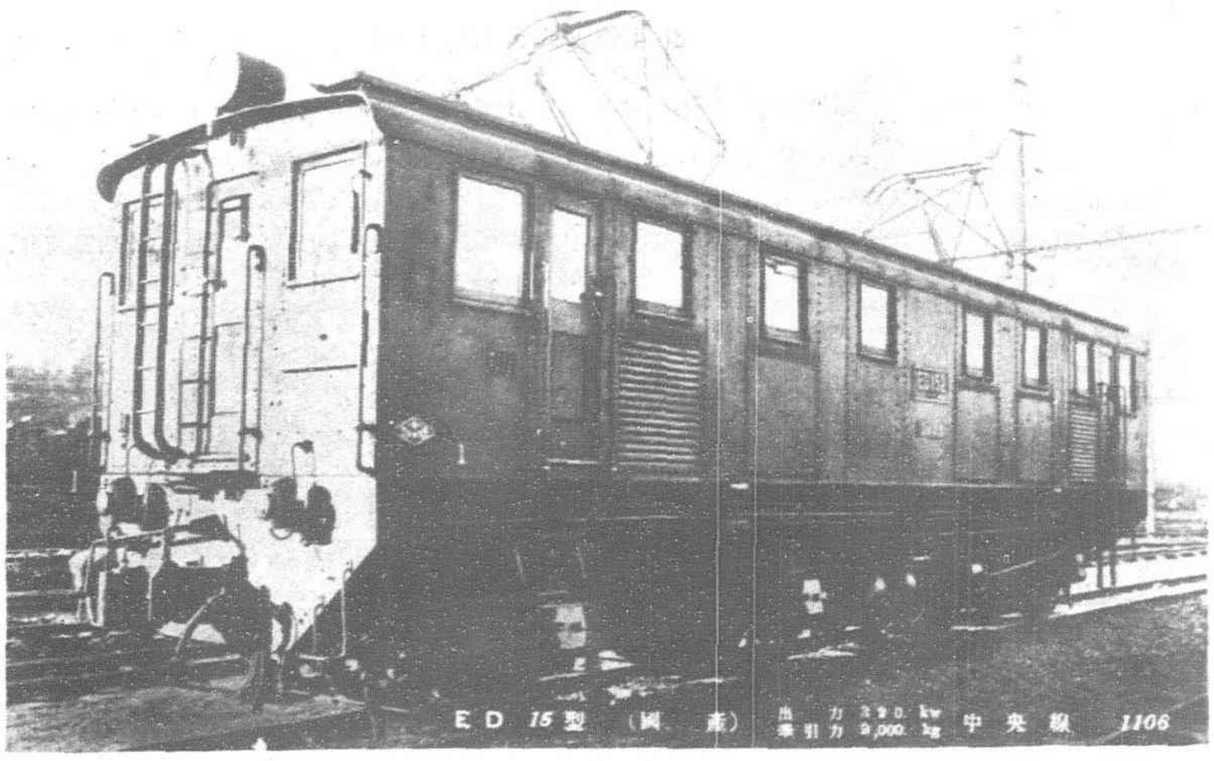
Exterior of Kanda, Tokyo. D.C. substation: Right, Switching Station; Left, substation



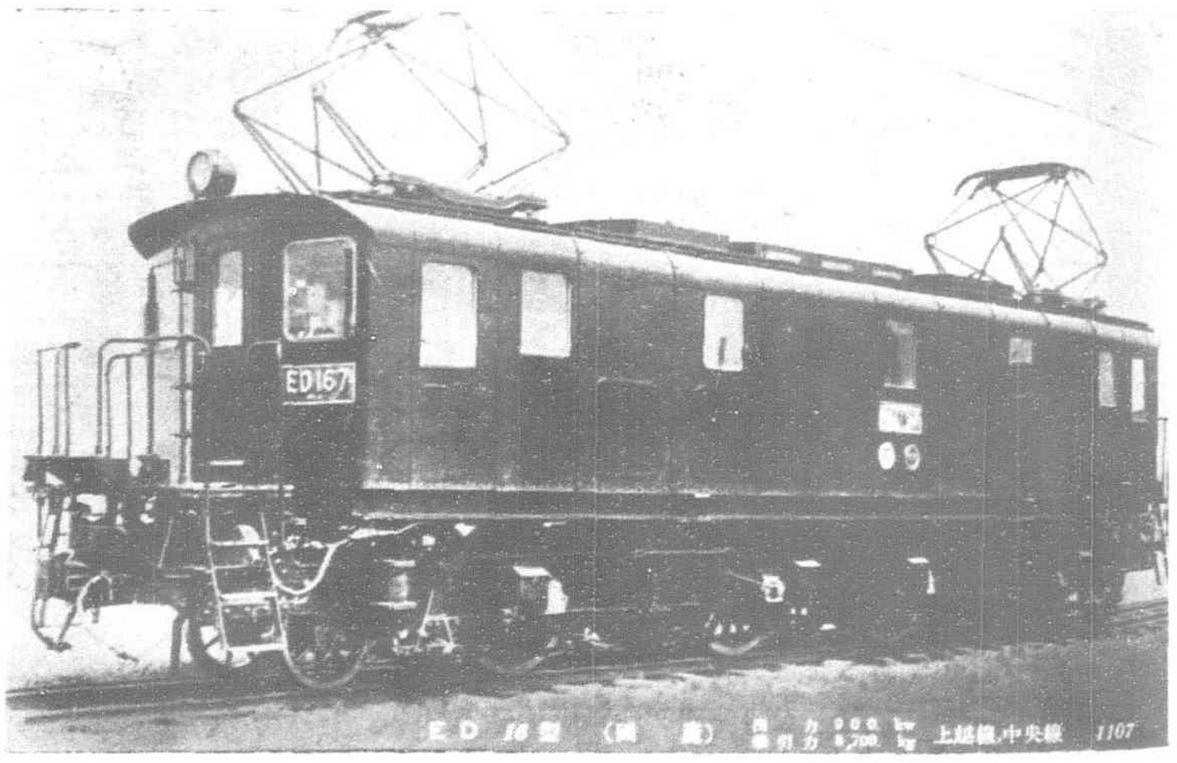
Type ED40, Japan, 740 kw., 11,400 kg. Tractive Force, Shinetsu Line



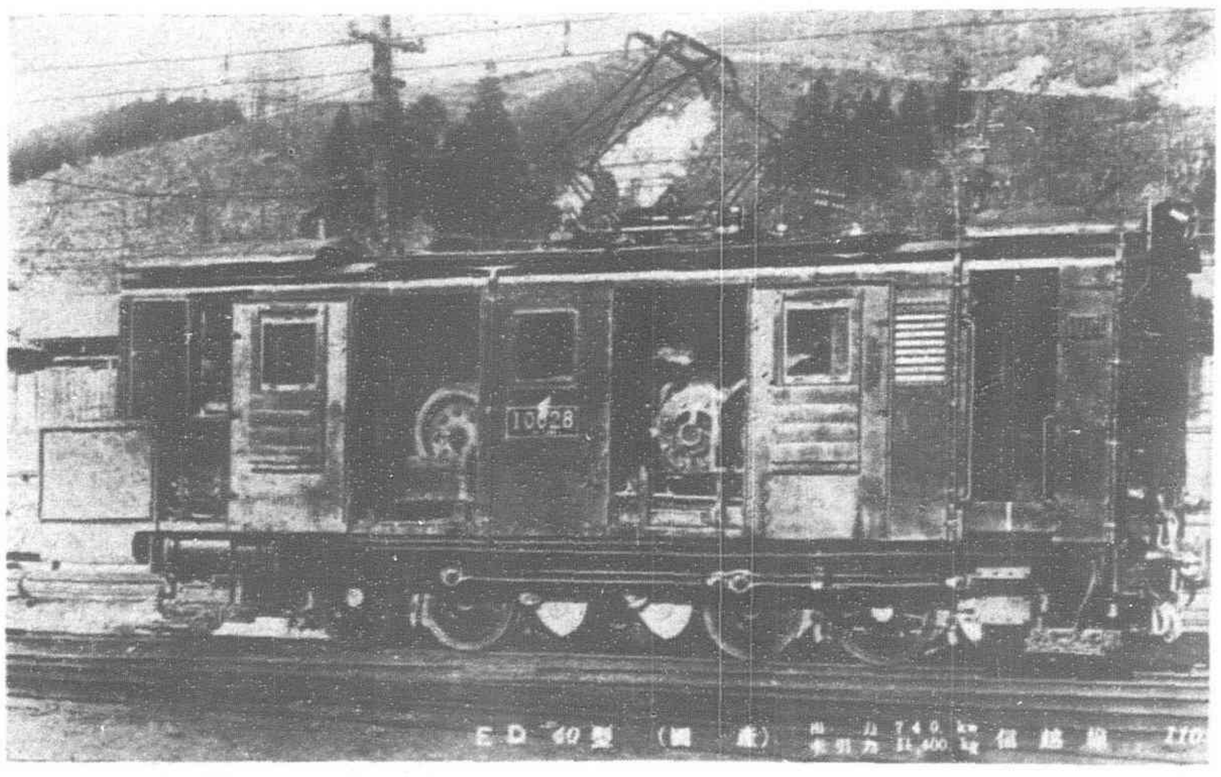
Type ED17, England, 820 kw., 10,300 kg. Tractive Force, Chuo Line



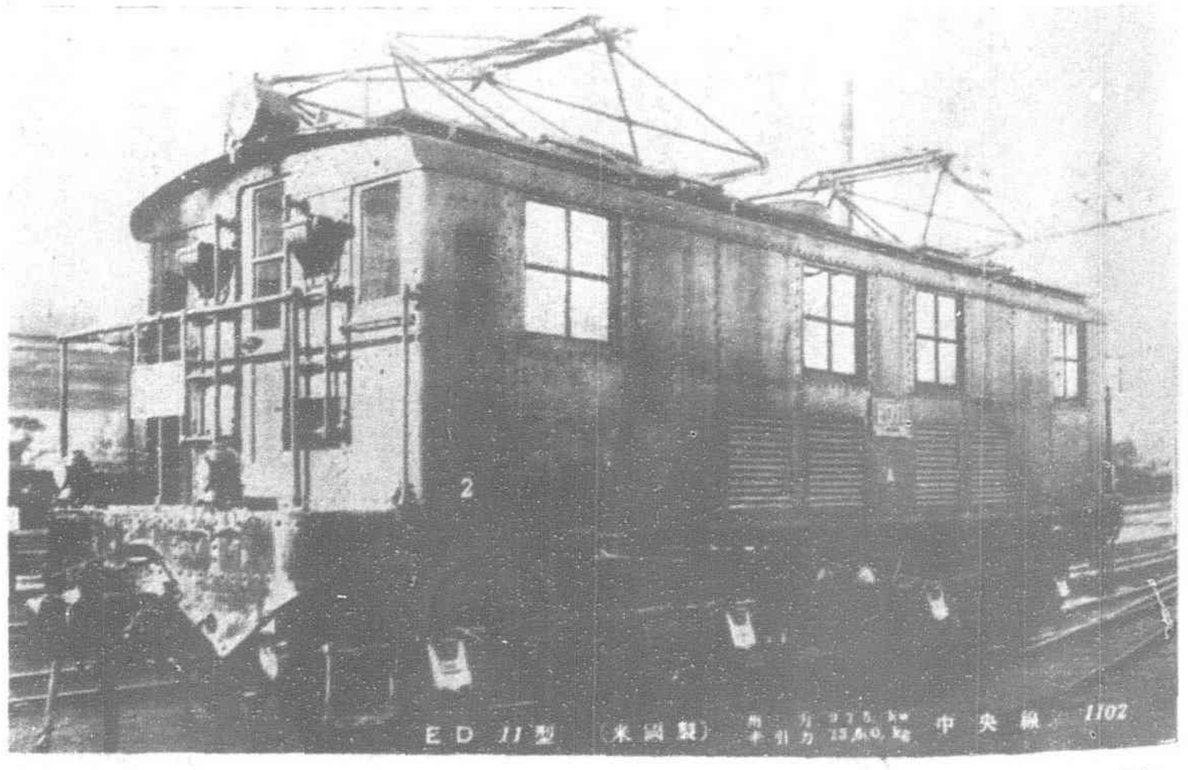
Type ED15, Japan, 320 kw., 9,000 kg. Tractive Force, Chuo Line



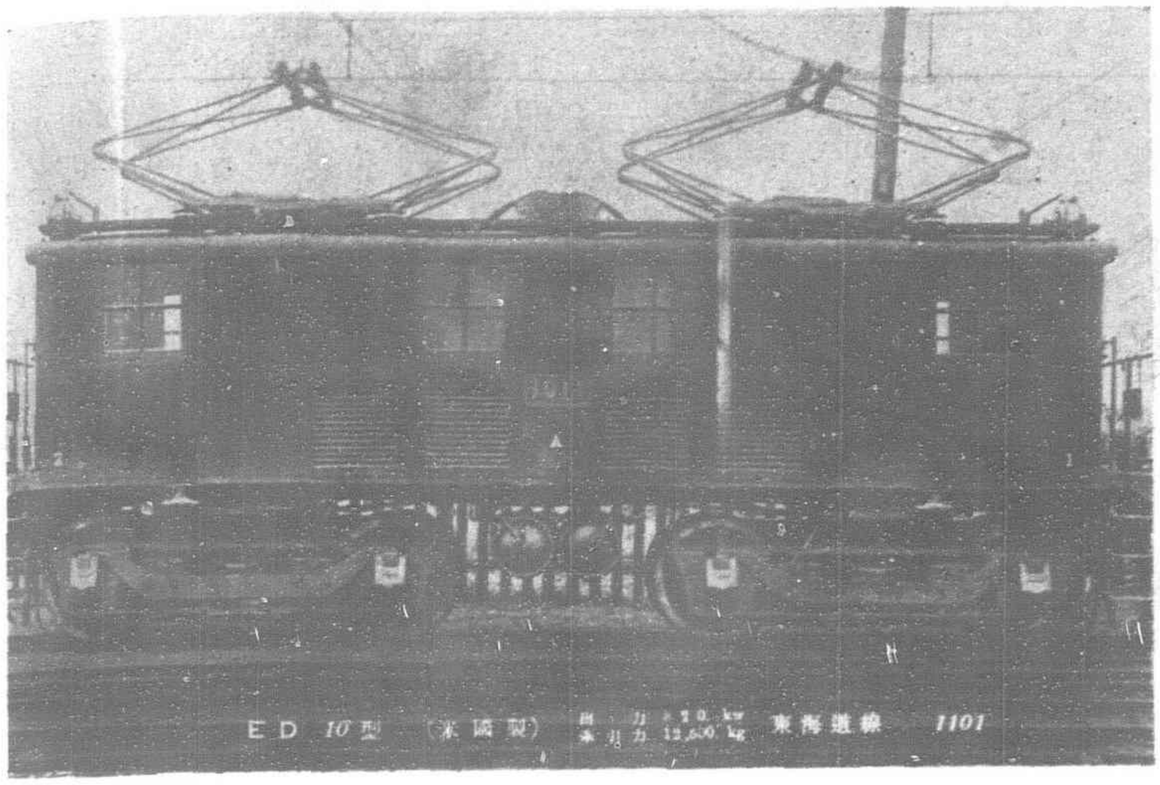
Type ED16, Japan, 900 kw., 8,700 kg. Tractive Force, Joetsu Line



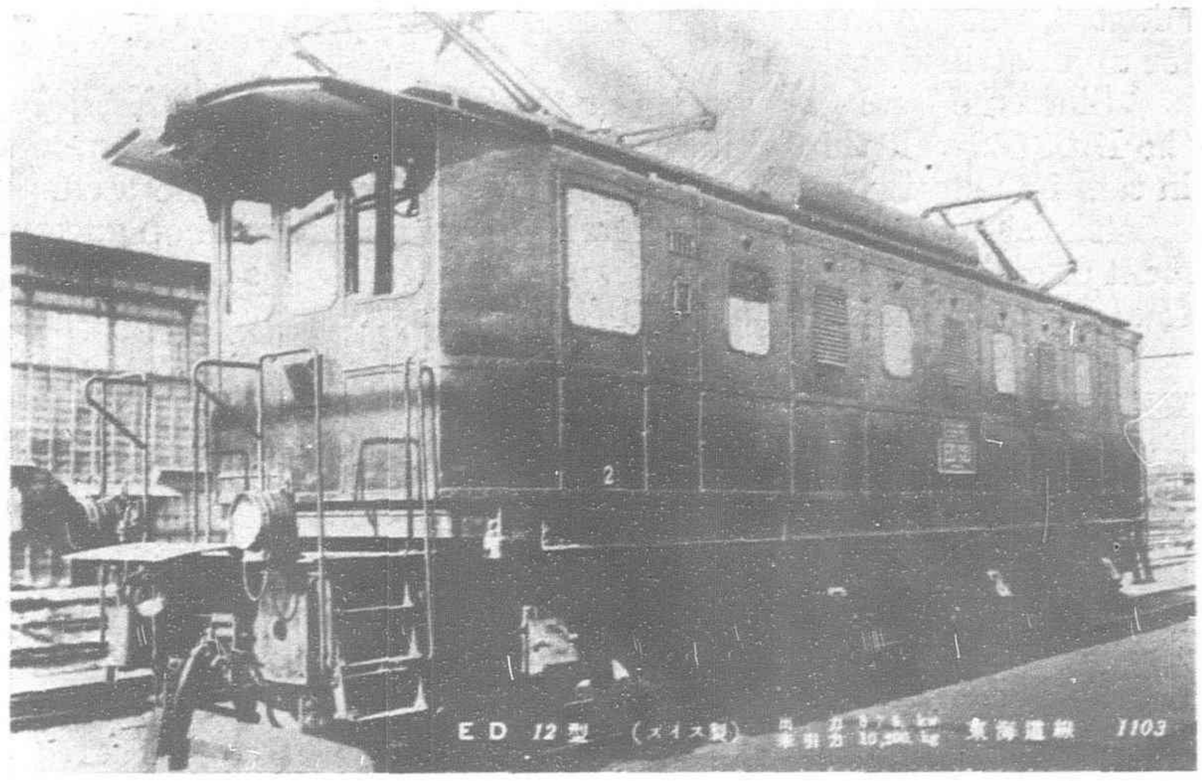
Type ED40, Japan, 740 kw., 11,400 kg. Tractive Force, Shinetsu Line



Type ED11, U.S.A., 975 kw., 13,600 kg. Tractive Force, Chuo Line



Type ED10, U.S.A. 820 kw., 12,500 kg. Tractive Force, Tokaido Trunk Line



Type ED12, Switzerland, 875 kw. 10,200 kg. Tractive Force, Tokaido Trunk Line

Electric Locomotives

Initial electric locomotive service in Japan was begun in 1912 when, under the Abt system, electrification was effected along a distance of 11.2 kilometers in Usui Pass, which has many tunnels and a steep grade of 6.7 per cent. Ever since mainline electrification was projected in 1919, electric locomotive operation has been in effect along several stretches of the Tokaido line as well as other sections. Electrified parts of main lines are given in the following table:

SECTIONS HAVING ELECTRIC LOCOMOTIVE OPERATION

Line	*Terminals of Electrification*	*Route Length Km.*	*Year Electrified*
Shin-etsu	Yokokawa-Karuizawa ..	11.2	1912
Tokaido Main and Branches	Tokyo-Atami	104.6	1925-1930
	Ofuna-Yokosuka	15.9	
	Shintsurumi-Tsurumi ..	3.9	
Chuo	Iidamachi-Kofu	130.2	1931
Joetsu	Minakami-Ishiuchi	41.5	1931
Total		307.3	

Locomotives.—When electric locomotives were first adopted on the Shinetsu line they were all of foreign make, but since 1919 home-made ones have been in the majority. To-day many Japanese built locomotives see service on the Tokaido as well as other lines.

There were a total of 131 electric locomotives in use at the end of March, 1933, with nine sheds for housing. Allowing for a 10 per cent voltage drop from the total number, two standrad classes of locomotives operated electrically exist on the Japanese railroads. One of these classes has four-motor locomotives developing 230 kw. each on a one-hour rating and weighing 77 metric tons, while the other consists of six-motor locomotives of the same capacity, with a weight of 100 metric tons each. When needed, locomotives in multiple are put into service along sections having heavy grades. The table below gives the aggregate traffic volume carried by electric and steam locomotives within recent years:

Year	*Car-Km. (by Elec. Loco.) (Km.)*	*Car-Km. (by Elec. Car) (Km.)*	*Total*	*Car-Km. (by Steam Loco.) (Km.)*	*Grand Total*
1929 ..	146,464,955	277,705,880	424,170,835	5,236,709,504	5,660,880,339
1930 ..	113,304,795	318,206,948	431,511,743	5,034,363,122	5,465,874,865
1931 ..	150,175,950	309,630,472	459,806,422	4,949,116,551	5,408,922,973
1932 ..	169,536,424	327,397,679	496,934,103	4,959,887,856	5,456,821,959

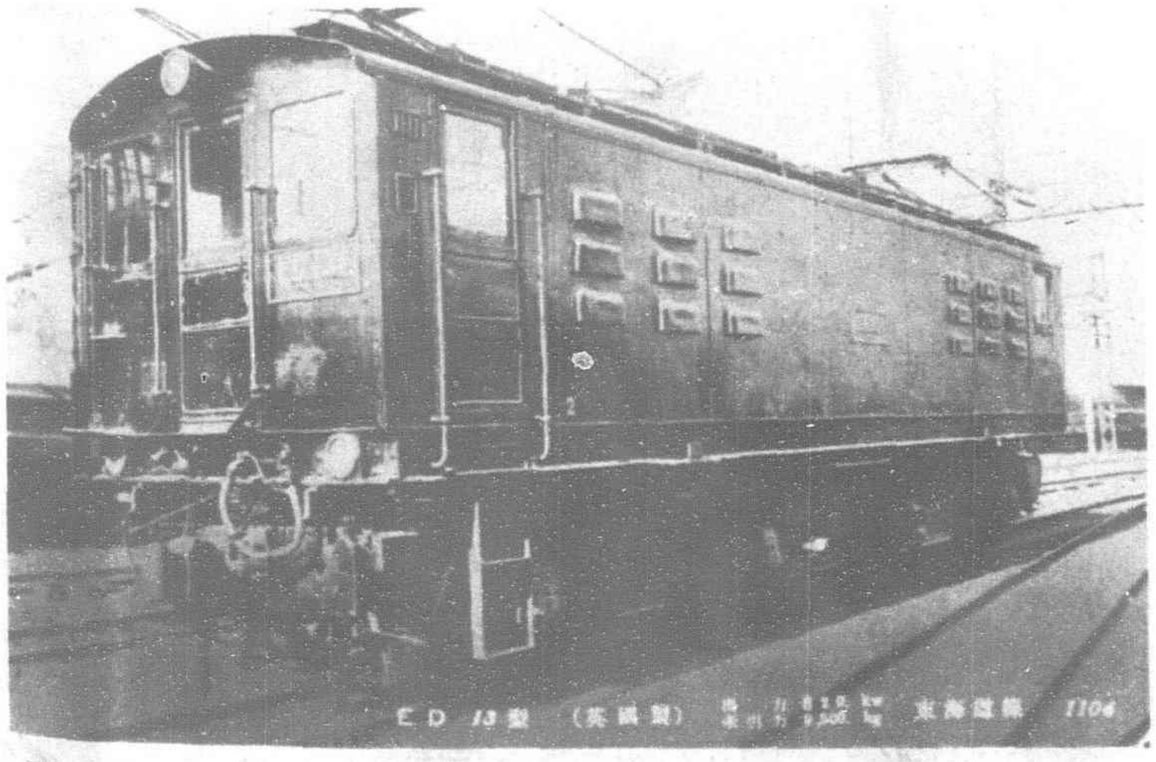
Note.—(1) A decrease in car-kilometers shown by electric locomotives in 1930 is caused by electric locomotive passenger service having been changed to motor-car operation on certain sections.

(2) Car-kilometers are calculated upon the basis of one car per 10 metric tons of weight.

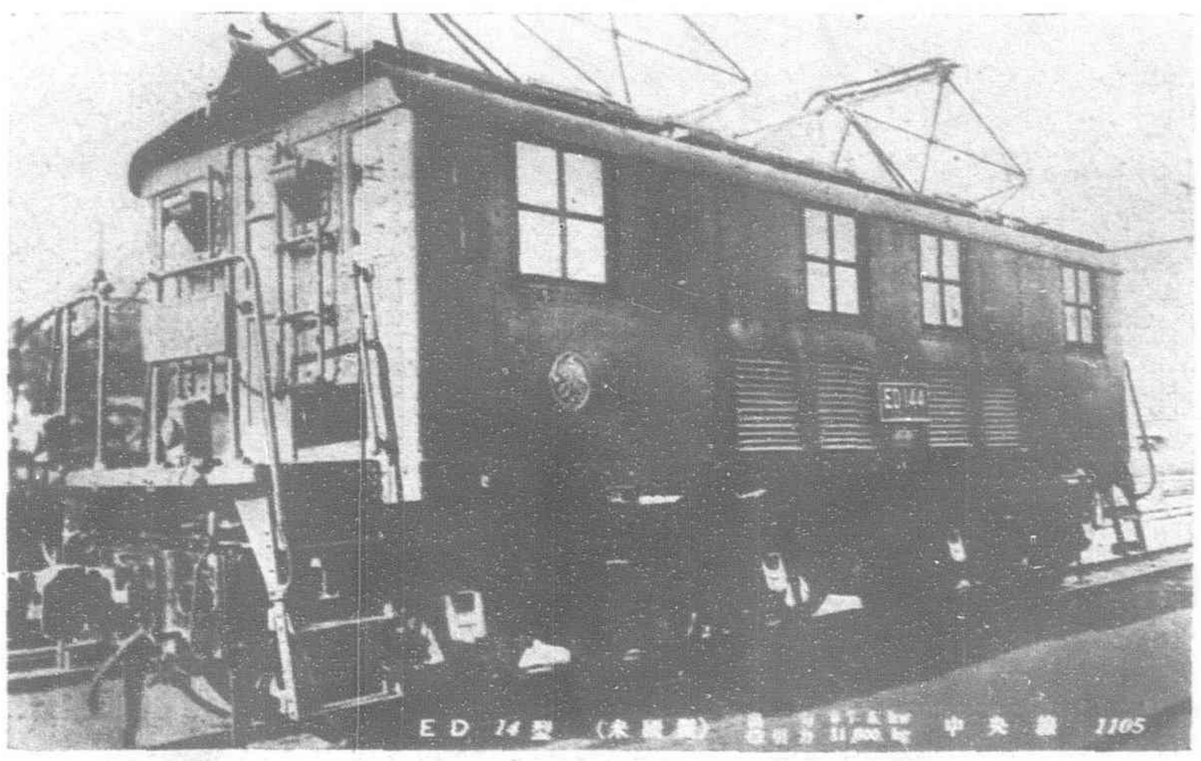
Electric Power

Electric Lines.—Initially electrified lines were all D.C. 600-volts, and overhead double-trolley wires were used. In 1914, the D.C. 1,200-volt, overhead single-trolley system was installed along the section between Tokyo and Yokohama, and the use of 1,200-volts was extended gradually to other lines.

During the past few years when new electrification has been projected for main lines, the D.C. 1,500-volt system has been



Type ED13, England, 820 kw., 9,500 kg. Tractive Force, Tokaido Trunk Line



Type ED14, U.S.A., 975 kw., 11,600 kg. Tractive Force, Chuo Line

adopted, and the former lower voltage was stepped up to 1,500-volts for all electrified sections.

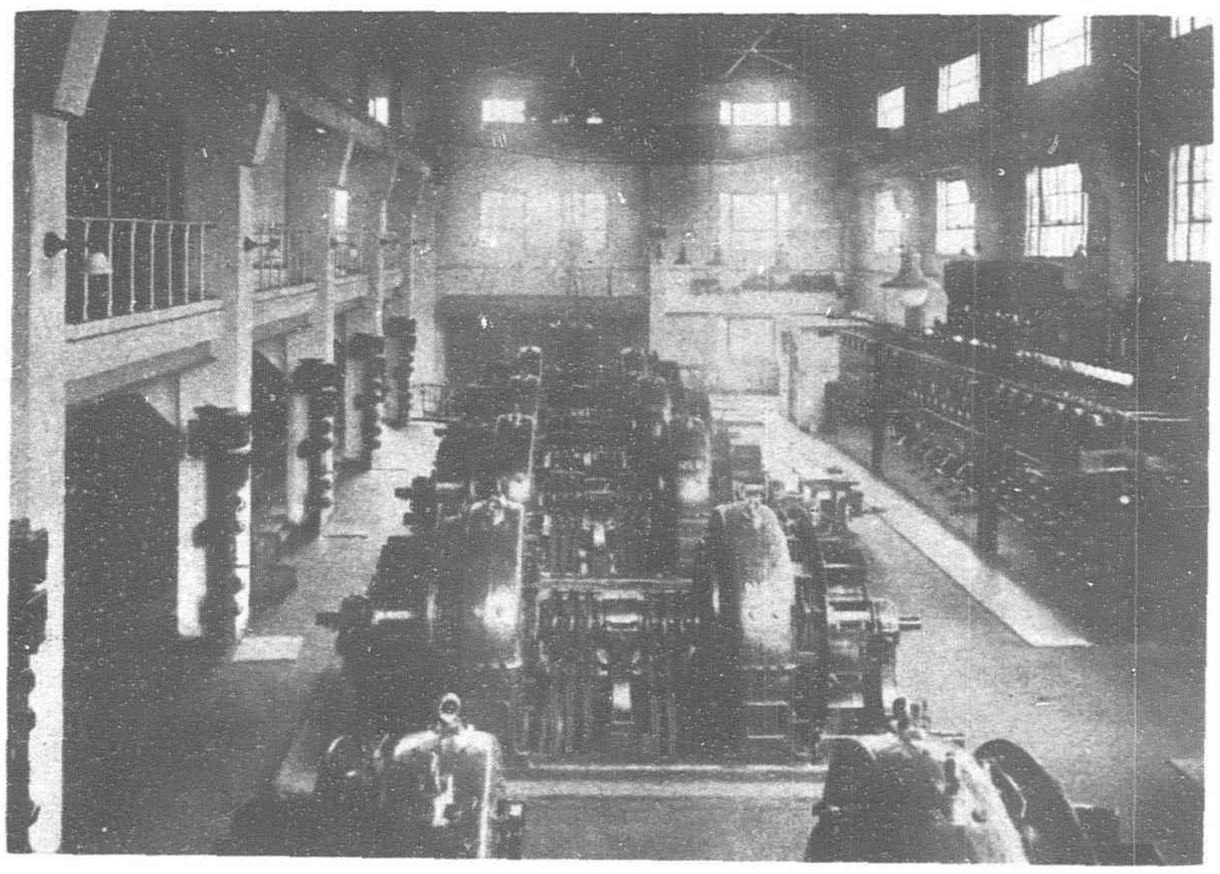
Since the Usui Pass section on the Shinetsu line was electrified, the D.C. 650-volt third-rail system has been found practical, except in terminal station yards where overhead trolley wires are used.

The simple catenary construction is commonly used on government electrified lines, but the compound catenary has been resorted to along the Tokaido high speed right-of-ways.

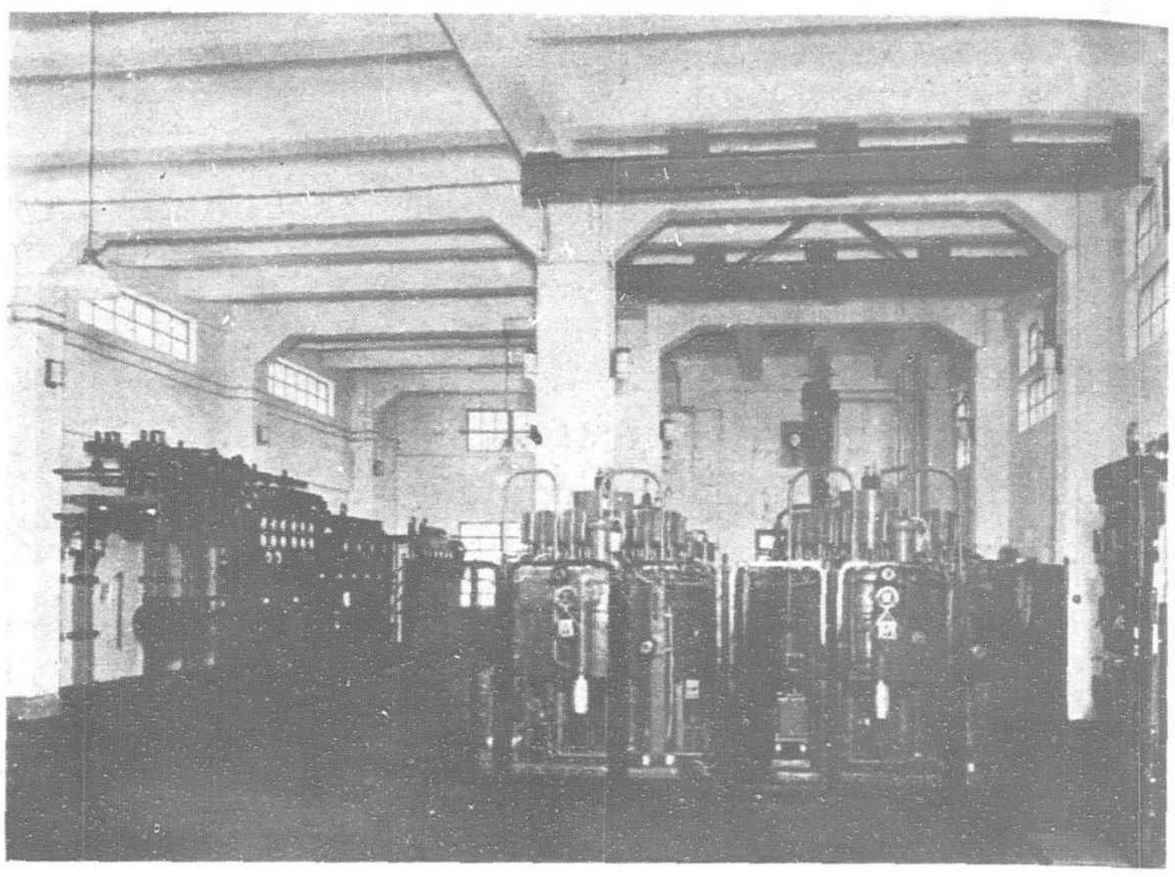
For heavy traffic sections 170 sq. mm. copper contact wire has been found necessary, but ordinarily 110 sq. mm. wire is satisfactory.

Spans of 80 meters for compound catenary and 45 meters for simple catenary are standard for the distance between supports along straight-line sections; while on curved-line sections 27 and 36 meter intervals were laid out.

Steel towers or poles are customary within city areas. Elsewhere special wooden pole structures carry overhead lines, feeder

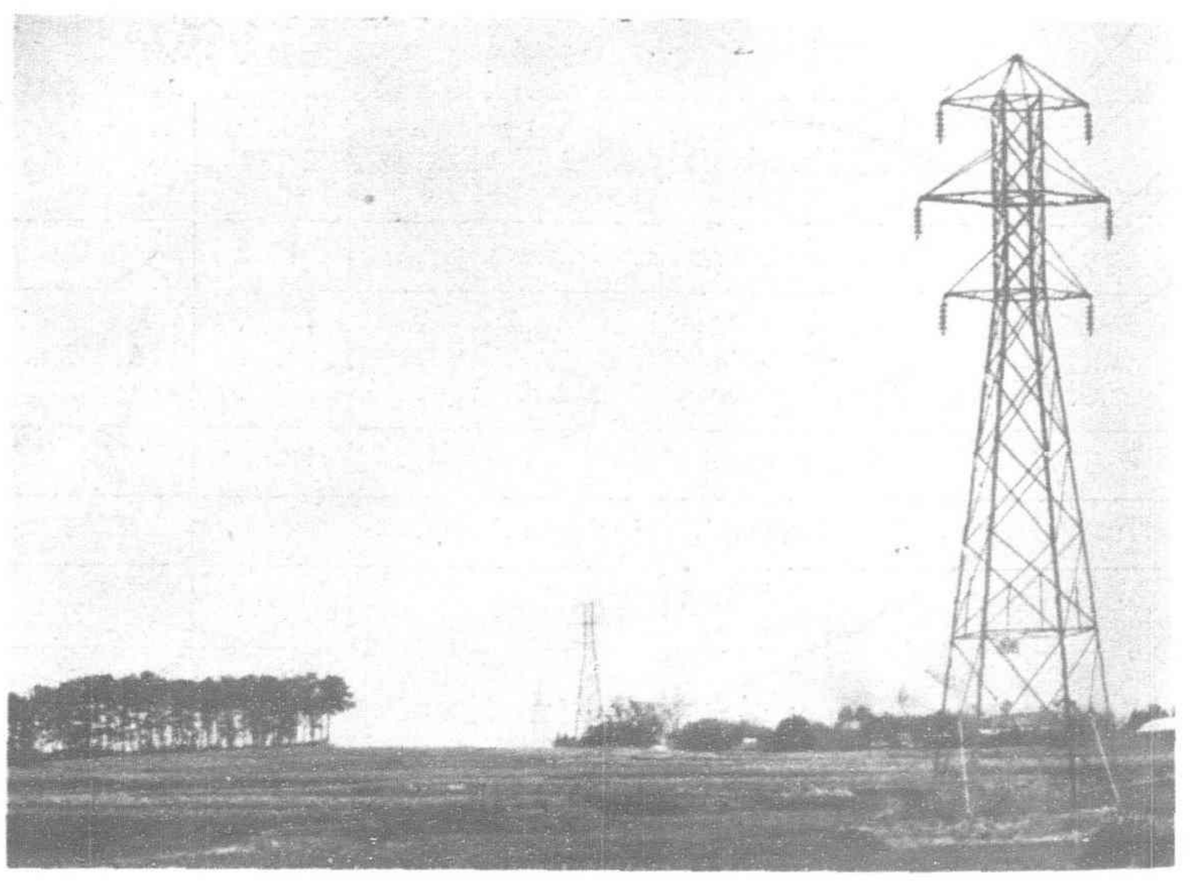


Interior of Ohji, Tokyo D.C. substation, five 2,000 kw. Rotary Converters

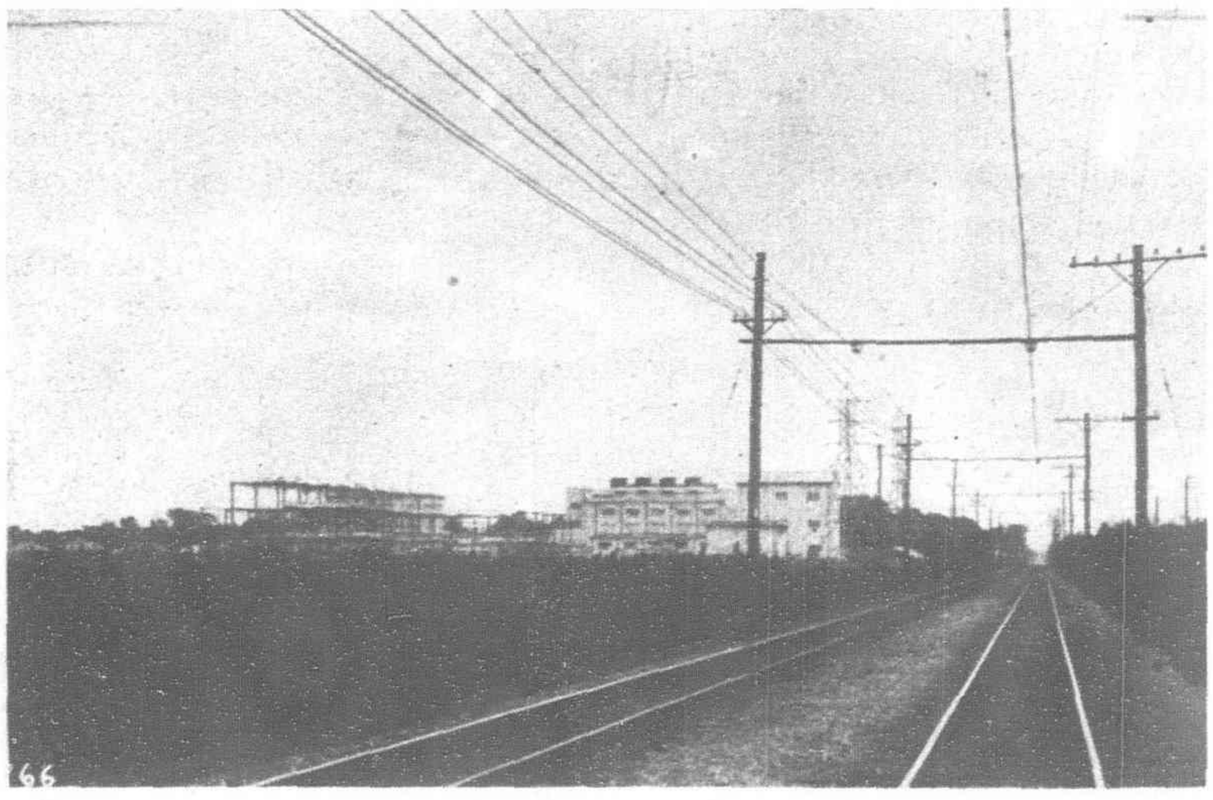


Interior view of Kanda D.C. substation, two 2,000 kw. Mercury Arc Rectifiers

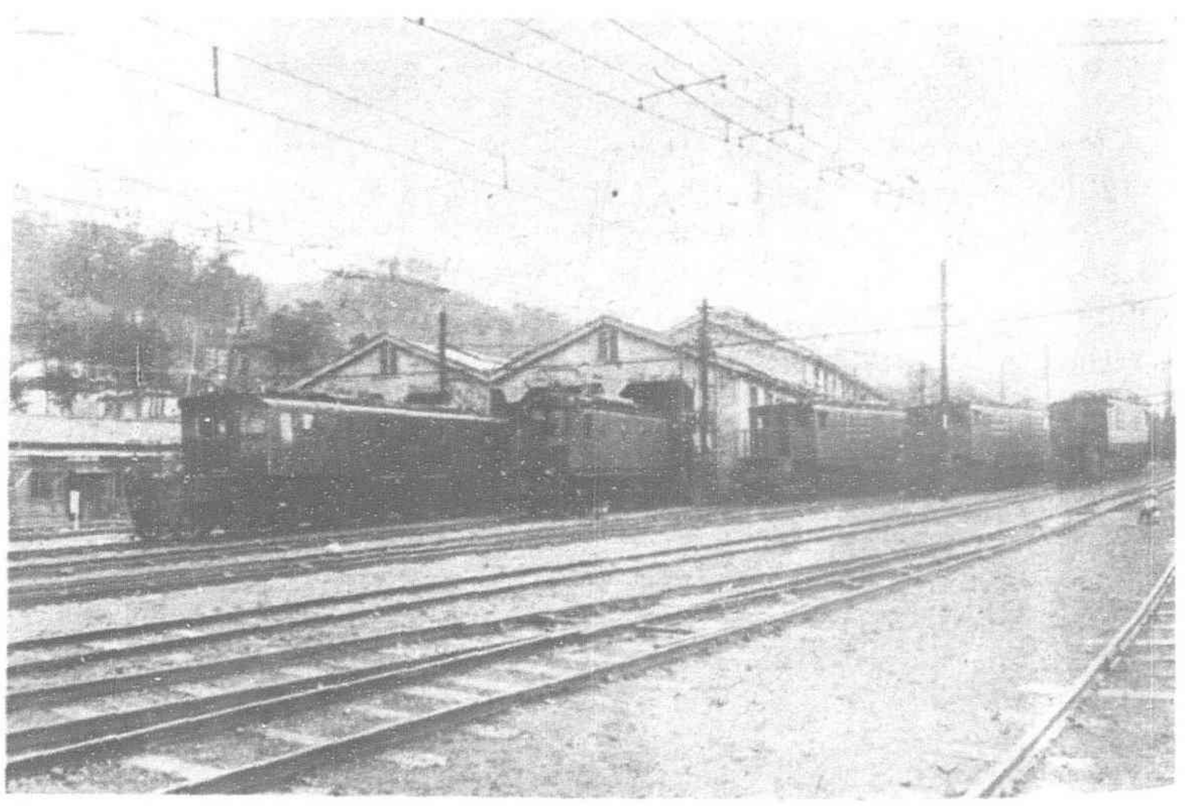
Power Dispatching Room, Electric Power Section Office



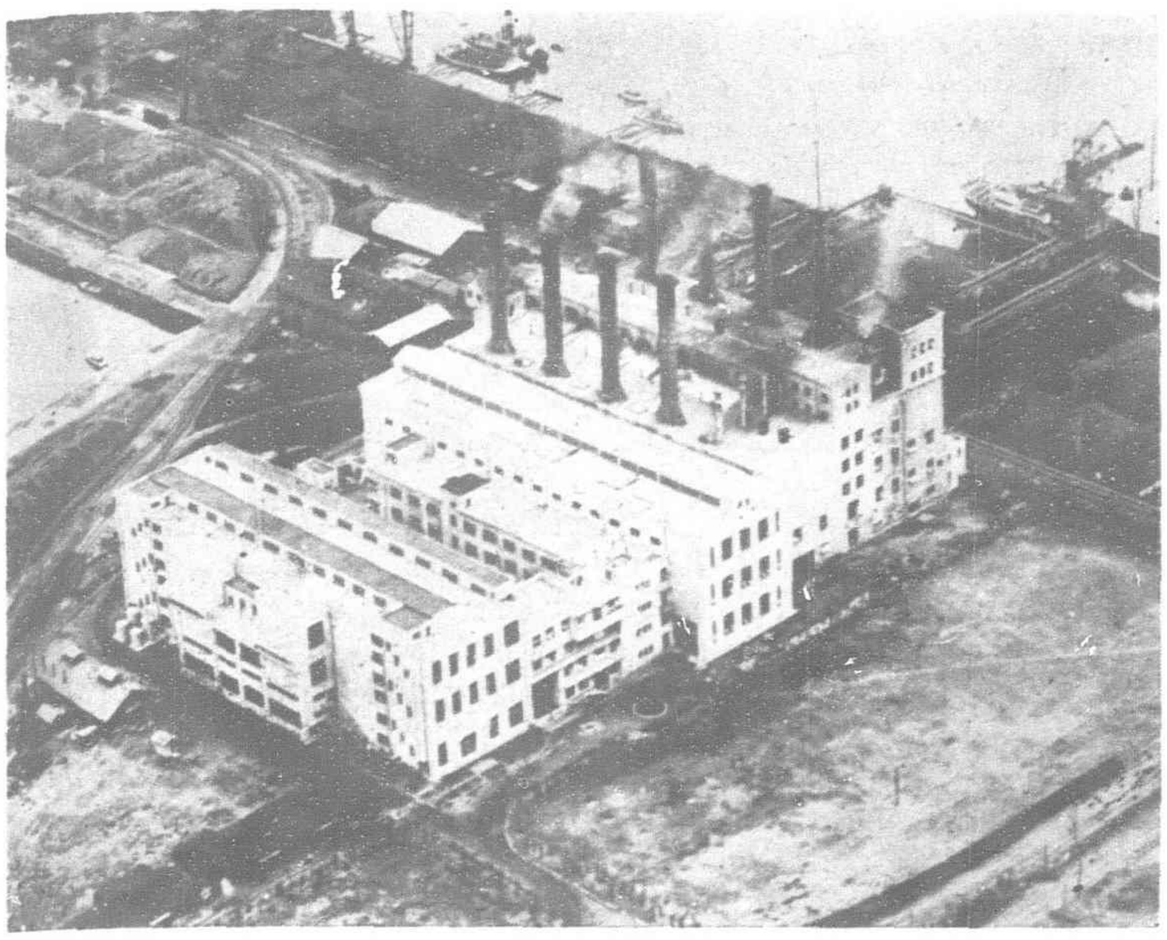
Sixty-six kv. Standard Transmission Towers near Tokaido Main Line



Electric Interurban right-of-way near Musashi-Sakai, with D.C. substation in background, Chuo Line



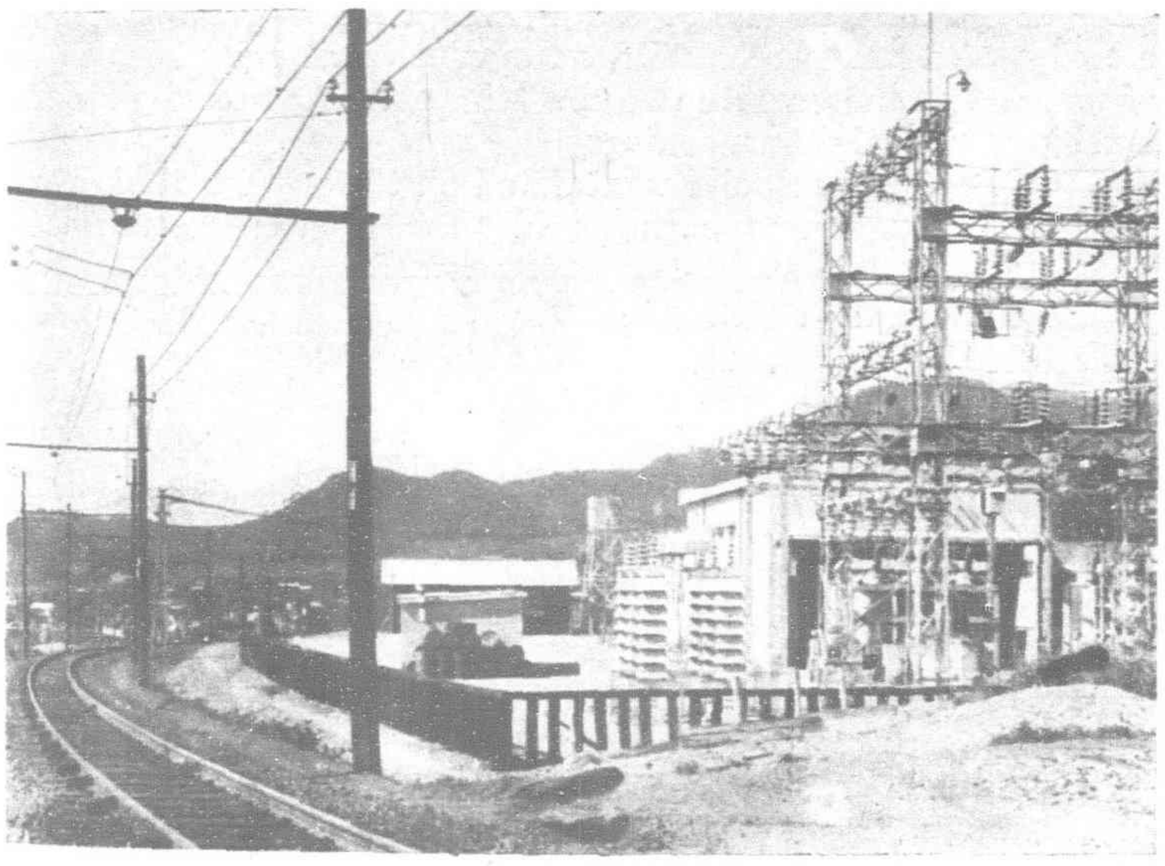
Electric Locomotive Sheds at Kozu, Tokaido Line



Exterior view of Kawasaki Electric Power Plant for Japanese Government Railways

and current distribution wires. Two bonds, laminated or stranded with compressed terminals are used at joints to connect rails for the return circuit.

Substations.—When the Chuo line came under government operation, one substation served an electrified stretch of 12 kilo-



Katsunuma D.C. substation, Chuo Line

meters. Later several substations were equipped for service as extensive plans for electrification were carried out. Now there are a total of 30 substations on all the government lines.

For converting sets in substations, rotary converters are installed to the exclusion of nearly all others, but recently a number of mercury arc rectifiers were tried out with satisfactory results. All substation equipment put in since 1927 is of domestic manufacture.

During the initial period of electrification, the continuous rated output of converter units was 100 or 300 kw. at 600-volts and 25-cycles, however, later this was increased to 450 or 500 kw. In 1920 when the 50-cycle source was adopted, there came into use a pair of converters connected permanently in series and developing 2,000 kw. at 1,200-volts. For the past 12 years, 2,000 kw. at 1,500-volts has been used as standard for converter units.

Formerly substations with installed capacities of 300 to 600 kw. each were in use, but recently substation capacities have increased greatly and range from 3,000 to 12,800 kw. for each station.

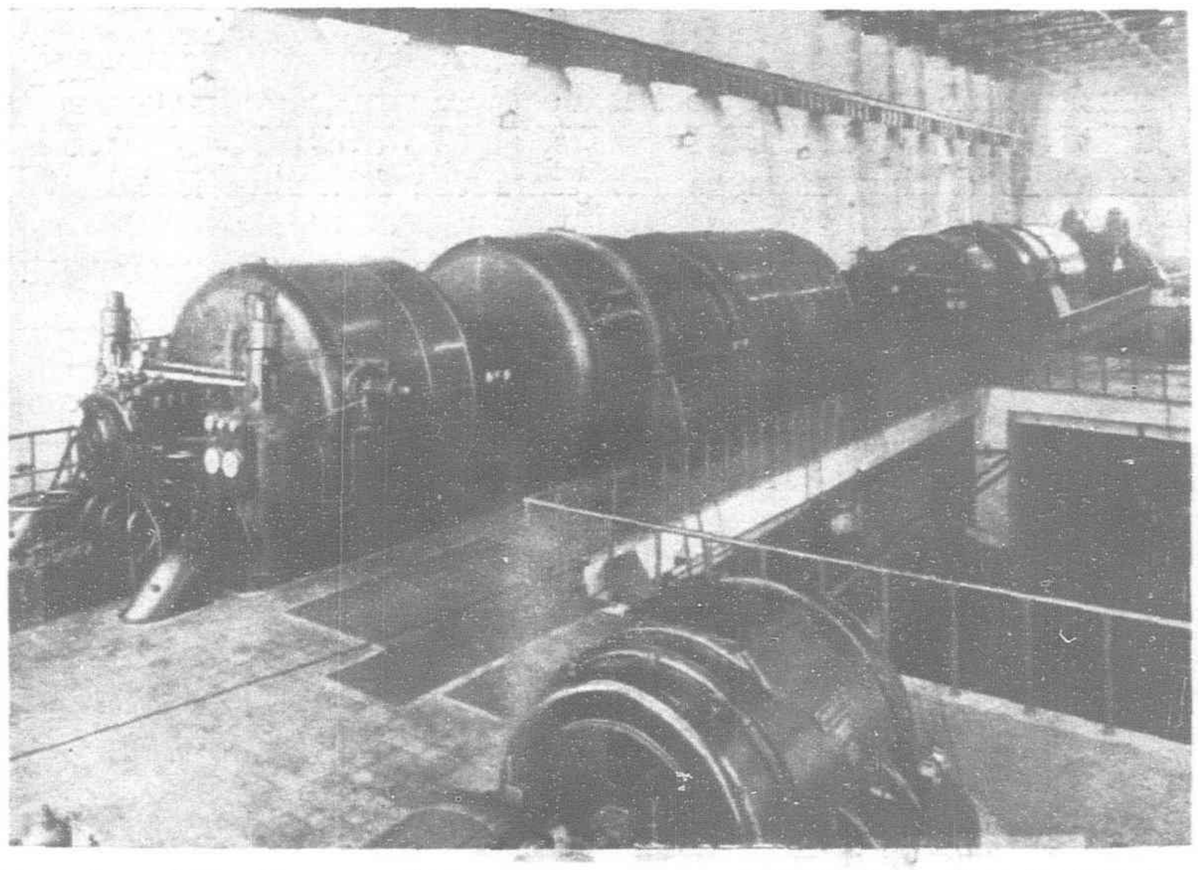
Transmission Lines.—In the past, 25-cycle power stations were established, and connecting the substations, 3-phase overhead or underground transmission lines were stretched ; but since 1920, 50-cycle power has been bought from a private electric power company. Therefore, 50-cycle, 11 kv., 3-phase underground cables have been installed to connect the power source to the government owned substations, and the 25-cycle system was gradually discarded. To-day 50-cycle, 22 kv. underground cables are used generally within city areas, while 66 kv. overhead lines are stretched outside city boundaries, thereby constituting a transmission network. Steel tower structures support all overhead high tension lines. The routes and approximate total lengths of transmission lines are shown in the following table :

(March 31, 1933)

Classes	*Route Length (Km.)*	*Aggregate Length of Circuits (Km.)*
66,000-volts, Overhead	270	540
22,000-volts, Underground .. 11,000-volts, Underground ..	100	440
Total ..	370	980

Source of Power.—When electric railway service was first inaugurated in Japan, the needed power was supplied by a steam-generated power plant having a capacity af 600 kw. and 25-cycles. Subsequently this plant was taken over by the government. Some few years later, as more and more power came to be required, D.C. source for some sections was also purchased from street railway companies.

In 1914 the mond-gas generated Yaguchi power station was established by the railway ministry. It has a capacity of 6,000

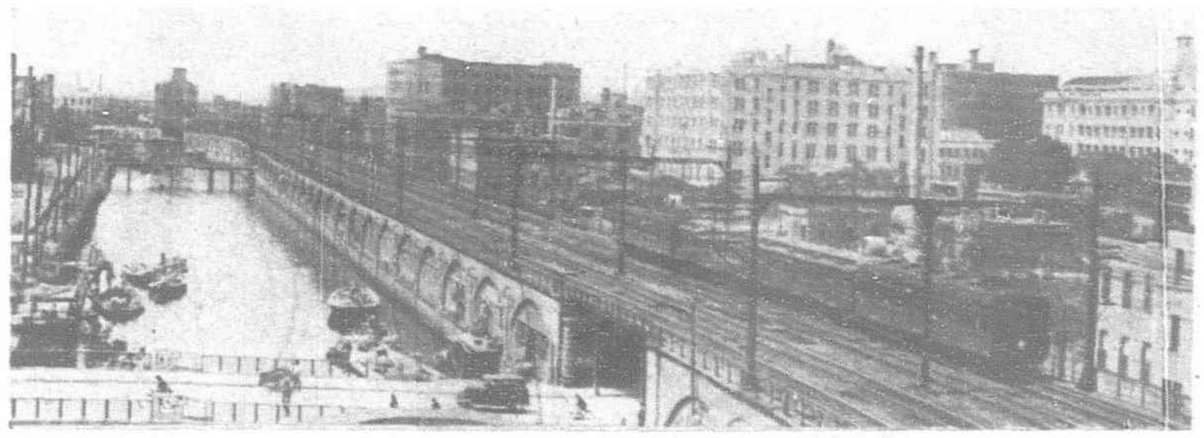


Interior of the Kawasaki Power Plant, two 25,000 kw. One 20,000 kw.

kw. and 25-cycles. Most of the direct current, which had hitherto been bought, was then available from this source. Nevertheless, ever since that time, the volume of power needed for electric operation rose steadily, so that in 1920 it became necessary to purchase 50-cycle power from outside sources, and gradually the 25-cycle system was given up.

In 1923 and 1930 respectively, the two government steam power plants at Akabane and Kawasaki came into use, with each

(Continued on page 383)



Elevated lines parelleling Canal near Shimbashi Station, Tokyo

Cement Works Electrification*

By R. ALLEN, A.M.I.E.E.

ONE of the greatest factors in the development of the Portland Cement Industry has been the use of electricity, and the numerous advantages initially claimed for electrical power have been more than justified by practical experience. The use of this form of power enables great economies to be effected over any other form of drive on account of the ease with which it can be transmitted and distributed.

A cement plant of necessity covers an extensive area and consequently the units where power is required are widely scattered, and it is only natural therefore, that it has now become universal practice to use electricity for the distribution of energy in a Cement Works.

The fact that the electric motor is so applicable to individual driving makes it possible for the machines used at different stages of manufacture to be grouped to better advantage; moreover, the electric motor requires a minimum of space for its accommodation, and, therefore, the maximum of space is available for manufacturing plant or material. The simplicity of control is another feature of considerable importance when driving by electricity, and the power consumption of any machine or section of the Works can be easily and accurately measured.

There are many other benefits to be derived from the use of electricity, but those already mentioned are sufficient to indicate why it has now become universal practice to use electrical power in a Cement Works.

The Metropolitan-Vickers Electrical Company has supplied a considerable amount of electrical equipment for use in the cement industry over the last thirty years, and as examples of what has been done during more recent years the following installations may be cited:—

(1) Messrs. G. and T. Earles, Hope—56 motors aggregating 2,492 h.p.
(2) Messrs. Oxford and Shipton Cement Ltd.—76 motors aggregating 1,257 h.p.
(3) The Ketton Portland Cement Co.—39 motors aggregating 1,976 h.p.
(4) The Green Island Cement Co., Ltd.—100 motors aggregating nearly 5,000 h.p.

The number and horse-power of motors are given as an indication of the size of the installations, but it must be understood that in most instances the motors were supplied complete with control gear and switchgear; and in some instances also with transformers and reduction gears, etc., all of Metropolitan-Vickers' manufacture.

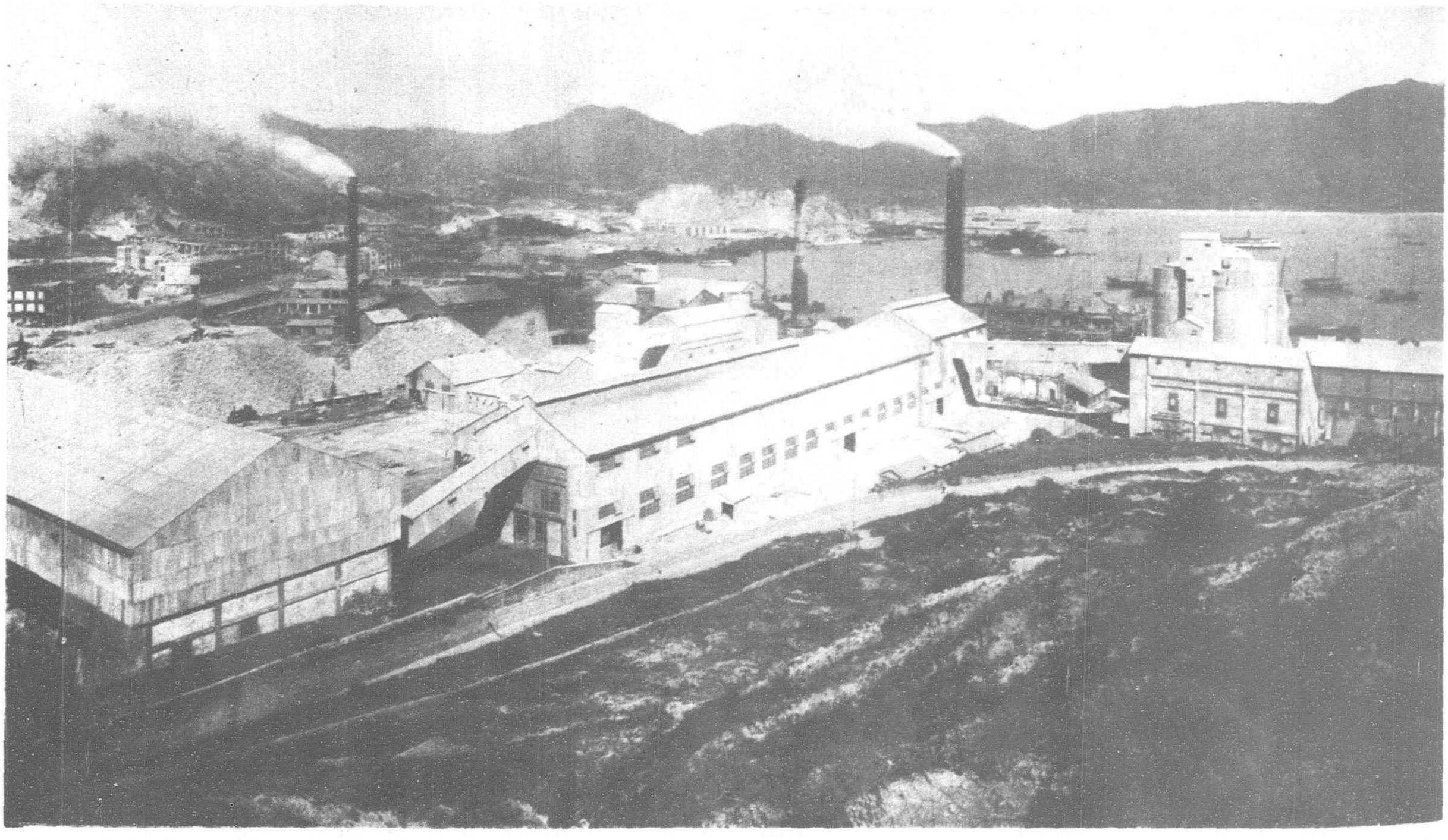
This Company's engineers have made a special study of the application of electrical apparatus to the various processes of cement manufacture, and have thus acquired an expert knowledge of the subject, which is placed freely at the service of the Company's customers.

This article is a description of a recent Cement Works Electrification—the complete equipment, comprising high and low tension switchgear, transformers, control-gear, distribution fuse boards, cables and standby engine-alternator set, being supplied and erected by this Company for the Works of the Green Island Cement Co., Ltd., Hongkong.

Mr. Henry Pooley, Junior, B.SC., A.M. INST. C.E., A.M.I. MECH. E., consulting engineer to the Company, was responsible for the complete engineering details of the scheme, involving the design and erection of a new works with an output of at least 100,000 tons of cement per annum with two new kilns and the necessary grinding, crushing and mixing machinery.

Mr. Pooley is to be congratulated on the success of his efforts, for in practice it has been found that the output exceeds the

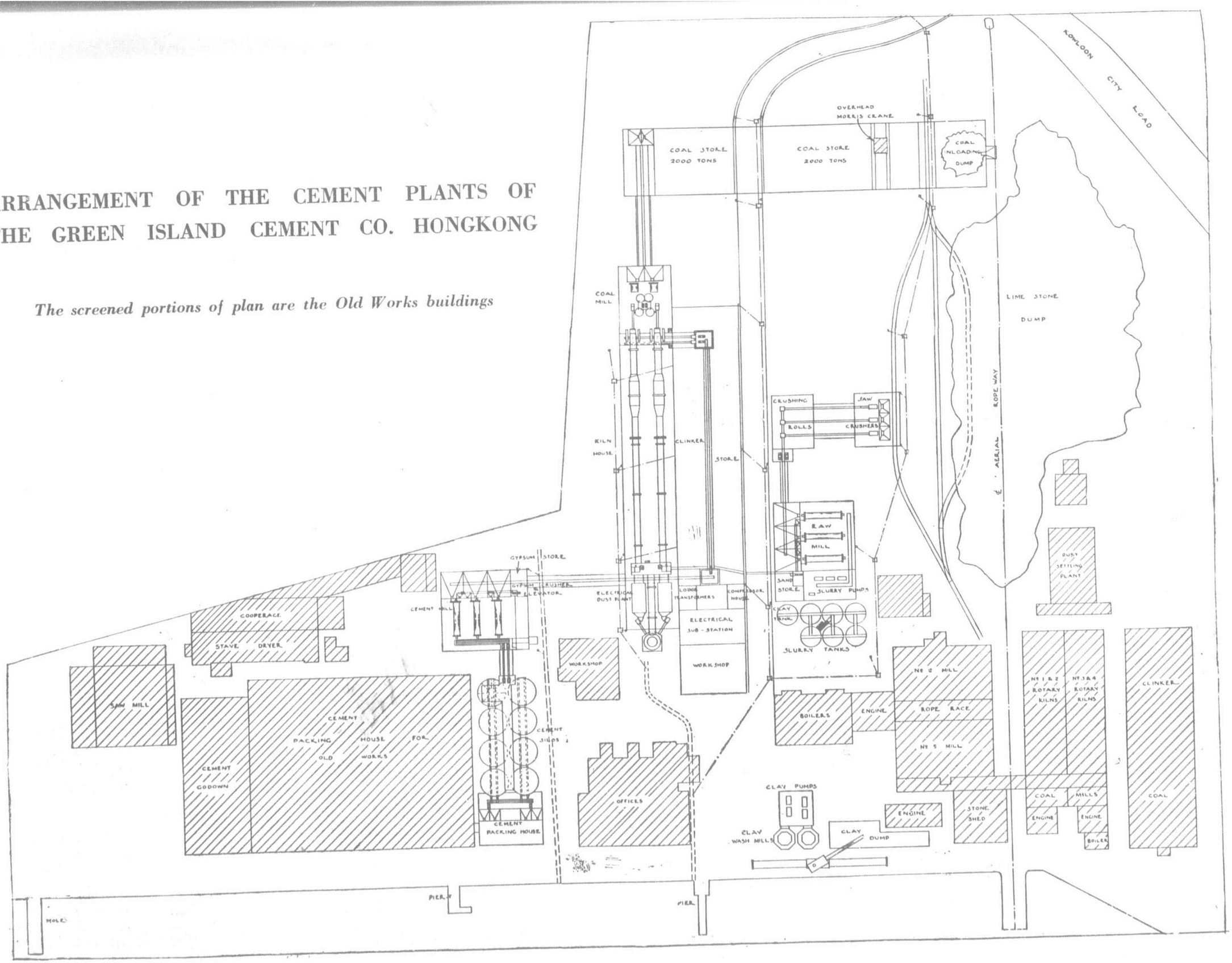
The Metropolitan-Vickers Gazette



View of the Green Island Cement Company's Works at Hongkong. On the left is the end of the Coal Store, this building being joined by a Gantry to the Kiln Building and the Cement Mill House seen on the right. Over the Cement Mill House are the Cement Silos. Over top of Kiln Buildings can be seen top of Raw Mill

ARRANGEMENT OF THE CEMENT PLANTS OF THE GREEN ISLAND CEMENT CO. HONGKONG

The screened portions of plan are the Old Works buildings



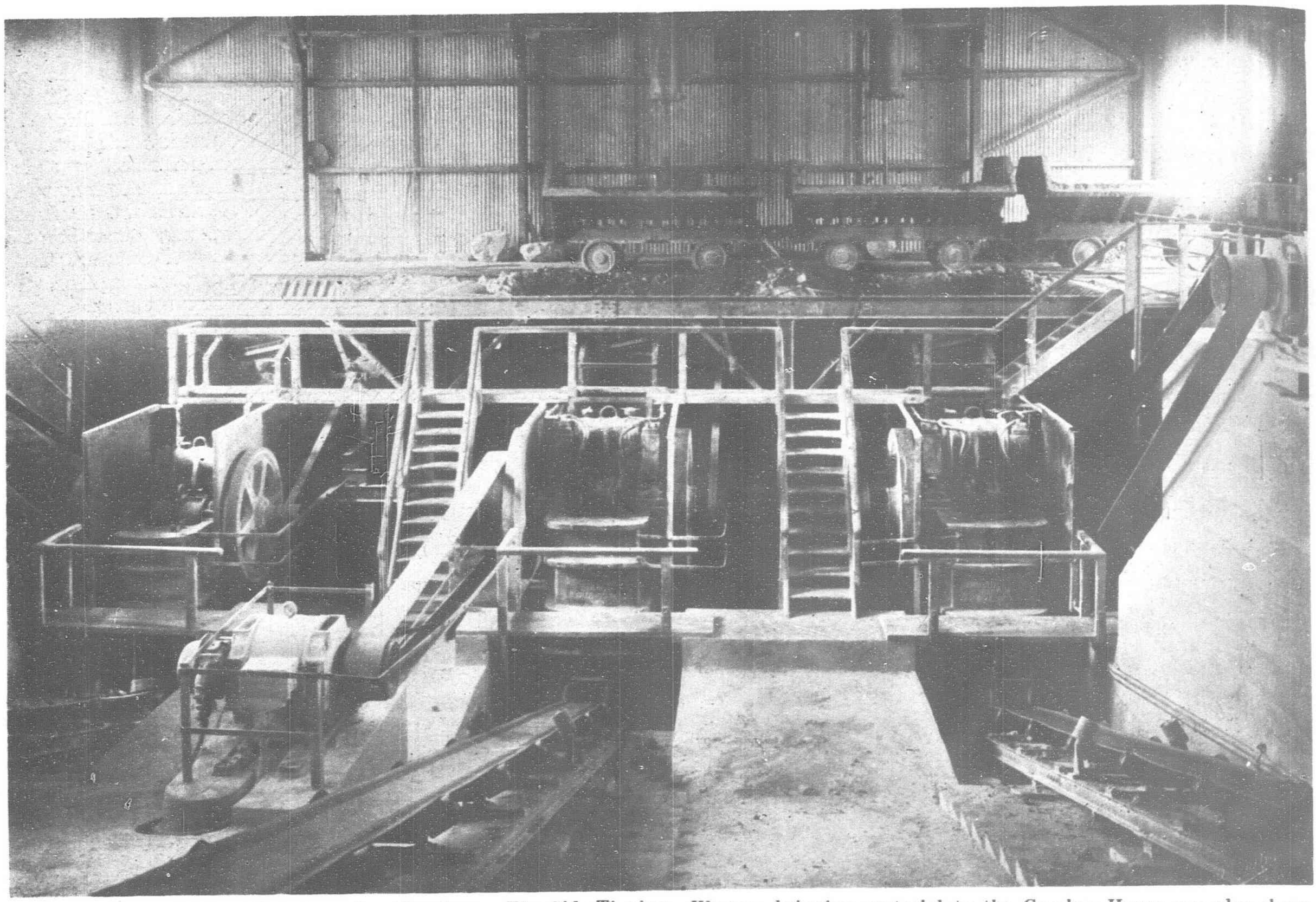


Fig. 1—Motor driving Limestone Jaw Crushers. The Side-Tipping Wagons bringing material to the Crusher House are also shown

guaranteed figure, and 100,000 tons of ordinary Portland Cement can be manufactured in addition to 10,000 to 15,000 tons of rapid hardening cement.

The main contractors were Messrs. Vickers-Armstrongs, Ltd., Barrow-in-Furness, who were responsible for the supply of all the plant, and it is to the credit of all concerned that the Works were completed in the short period of sixteen months from the time that the first foundation was put down until cement was actually produced.

Before proceeding to describe the equipment at the Green Island Cement Works it may be of interest to mention that the "wet" process of manufacture is adopted. There are two processes by which Portland Cement may be manufactured, and these are known as the "dry" process and the "wet" process, the two methods differing essentially in the treatment of the raw material. In the "dry" process the materials are dealt with in the dry or semi-dry state, as the name implies, and this method was usually adopted up to recent years in cases where the raw materials consisted of limestone and shales. In the "wet" process, utilized for comparatively soft materials, such as chalks and clays, water is added to the materials during the preliminary processes, the material entering the kiln in the form of a thick slurry.

The "wet" process has been adopted in the majority of Cement Works in this country, the principal advantages being cleanliness, less tendency for materials to segregate, and better opportunity to correct the mixture and obtain exactly the desired proportions.

The raw materials used at the Green Island Works comprise limestone and clay. The limestone, which is imported, is brought to the Cement Works by junk or large steamer, and arrives in pieces varying from about 2-ft. 6-ins. cube down to 6-ins. cube. It is stored in heaps until required. The clay is dredged from the sea bottom and carried to the Works by the Company's own lighters, where it is either deposited into the clay storage tanks or direct into the wash-mills.

There are two wash-mills into which the clay is discharged, each of which is 14-ft. in diameter. Inside each wash-mill there is a center shaft, from which massive radial arms are carried. Harrows are suspended by chains from these arms, the whole being driven through a crown wheel and pinion. By the rotation of the mill shaft the tines are dragged through the material, breaking and rubbing it down in the water, and at the same time the material is thrown against the sides of the mill, until it is finally washed down to the form of a thin mud or slurry. The wash-mills discharge into a common outlet, from which the pump suction pipe draws the clay slurry. The center shaft is driven at 25 r.p.m. through bevel gears from a horizontal shaft which runs at 130 r.p.m. and is driven through belting by a 40 h.p., 720 r.p.m. slip-ring motor controlled by an oil immersed circuit-breaker and rotor starter.

From the wash-mills the clay slurry is pumped by means of three-throw plunger pumps and delivered through pipes to storage tanks in the main portion of the Works. There are three pumps in the Wash-mill Pump House which are interchangeable and each is driven by a 15 h.p., 725 r.p.m. high torque squirrel-cage motor controlled by an auto-transformer starter. Each motor drives the pump through direct coupled worm reduction gearing.

As already explained, the limestone is stored in heaps, from which it is taken in side-tipping wagons and delivered into the Crusher House and is there automatically tipped into hoppers, of which there are three.

The limestone is then discharged through the hoppers on to specially designed feeders situated above the primary crushers, and by them the large material is moved steadily forward and fed into the crushers. There are three crushers—two of which are 30-ins. × 18-ins. swinging jaw type, the driven shaft of which rotates at 250 r.p.m. The drive of these two crushers is by belt and each is driven by a 60 h.p., 725 r.p.m. slip-ring type motor controlled by an oil immersed circuit-breaker and rotor starter. The third crusher is of a smaller size, 24-ins. × 13-ins., and is driven through belting by a 30 h.p., 720 r.p.m. slip-ring type motor controlled by a similar set of control gear.

The motors driving the limestone jaw crushers are shown in Fig. 1, which also shows the side-tipping wagons bringing the material into the Crusher House.

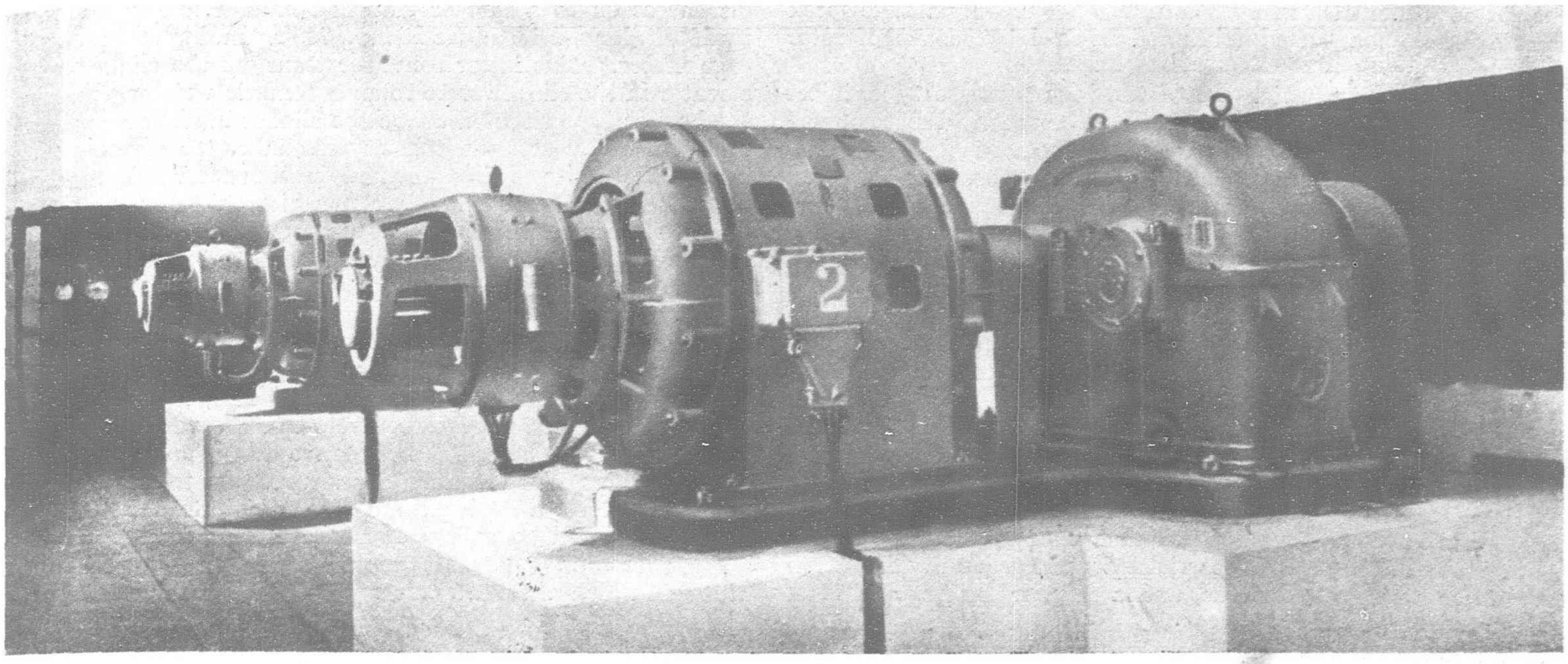


Fig. 2.—Motors driving Ball and Tube Mills through totally enclosed reduction gearing. The Three-Panel Switch-board for controlling the Motors is also shown

The crushed stone falls on to a 20-in. troughed inclined-belt conveyor 104-ft. long, inclined at an angle of 18 degrees. There are three such conveyors taking stone from the three crushers and they feed it to the three roller mills. Each roller mill consists of two sets of smooth gear driven rolls, both 36-in. diameter × 36-in. face. The stone entering is about 3-in. size and it is reduced in the roller mills to $\frac{3}{4}$-in. size, which is sufficiently small for delivery to the compound ball and tube mills. The speed of the rolls is 15 r.p.m., while the driven shaft runs at 85 r.p.m., and each is driven through belting by a 60 h.p. slip-ring type motor, which are exact duplicates of the 60 h.p. motors driving the jaw crushers.

From the rolls the crushed stone falls through chutes on to a horizontal troughed conveyor 30-ins. wide × 48-ft. long, and this conveyor feeds into two elevators which unload on to a flat belt conveyor 40-ins. wide, which feeds the crushed limestone into one of three reinforced concrete hoppers of 200, 215 and 200 tons capacity respectively, which act as storage capacity and feeders for the three compound ball and tube mills.

The elevators and conveyors referred to are driven by high torque squirrel-cage motors controlled by means of auto-transformer starters.

It is at this point in the process that the limestone from the hoppers and the clay slurry from the storage tanks are brought together, and both are fed from their respective quarters in definite quantities for grinding together in the ball and tube mills.

Under each limestone hopper there is a feed table for feeding the crushed limestone to the ball and tube mills, and a pipe from the clay slurry feed tank feeds the clay slurry to the mills.

There are three ball and tube mills, each 40-ft. × 6-ft. 6-ins. diameter, which operate at 25 r.p.m. Each mill is driven by a 475 h.p., 750 r.p.m. synchronous induction motor and these motors together with those driving the dry mills serve to correct the power factor of the Works load. The motors drive the mills through totally enclosed reduction gearing and two of the sets are shown in Fig. 2, and it will be seen that the Mill Motor House is completely shut off from the mill by a brick wall. In Fig. 2 can also be seen the three-panel switch-board from which the motors are controlled, and liquid rotor starters are employed for starting. The driving units are particularly neat and compact, as can be seen from the illustration.

The material issuing from the ball and tube mills is slurry and by means of three slurry pumps, which are of the same type as those described for the clay slurry, the material is pumped into the slurry correcting tanks. The slurry pumps are installed in the mill house and are interchangeable.

For the purpose of correcting and storing the slurry six reinforced concrete tanks are provided, each 34-ft. high and 21-ft. 6-ins. in diameter, and the next part of the process is to feed the slurry into the upper end of the kilns.

Before continuing with the actual process it is interesting to note that both the slurry and the clay slurry in storage are kept agitated by compressed air continually passed through them, to minimize settling. The air supply for this and other purposes is provided by two double acting single stage vertical compressors direct coupled through gearing to 75 h.p., 485 r.p.m. slip-ring motors each controlled by an oil immersed circuit-breaker and rotor starter.

There are two kilns, each 254-ft. long including coolers and driven by 60 h.p. variable speed slip-ring motors. The motors are designed to give a speed range between 720 and 360 r.p.m. by rotor resistance control. Each motor is direct coupled to totally enclosed reduction gearing and this together with the kiln driving gear makes it possible by varying the speed of the motor to vary the speed of the kiln from one revolution in 48 seconds to one revolution in 95 seconds.

A general view of the Kiln House is shown in Fig. 3, and it presents a most impressive sight. The slurry after being fed into the upper end of the kilns is carried along continuously by the inclination and rotation of the kilns so that it slowly gravitates to the lower end. As the material approaches the lower end its temperature is increased until it reaches the burning zone, where it becomes converted into clinker. This resulting cement clinker drops through outlets at the bottom end of the kiln into coolers consisting of cylindrical containers mounted on the outside of the kiln, as seen in the foreground of Fig. 3. The spiral lifters in the cooler tubes carry the clinker in the opposite direction, and it finally leaves the cooler at the end of the tubes, falling into a chute and thence to either of the shaker conveyors which are fixed underneath.

The kilns are fired by blowing finely powdered coal into the lower end of them. The coal for this purpose is stored in reinforced concrete storage bunkers. From these bunkers the coal is extracted for grinding purposes by means of two feed tables, and delivered into the coal mills. Hot air drawn from the coolers is introduced into the feed end of the mills for drying the coal.

The coal mills are of the air-swept ball mill type, each mill being approximately 7-ft. 3-ins. diameter × 7-ft. 10-ins. long, and driven by a 150 h.p. slip-ring motor. The motors run at 725 r.p.m. and drive through suitable reduction gearing on to the mill countershafts, which run at 126 r.p.m. When the coal is ground sufficiently finely the draught draws it up a pipe leading to a cyclone separator, where it falls to the bottom and thence to elevators after passing through a second star feeder, which again acts as an air seal. The elevators are of the vertical chain-bucket type, each driven by 5 h.p., 725 r.p.m. squirrel-cage induction motors started by direct-on starters These elevators discharge the coal into two mild steel hoppers, from which it is fed by extractor conveyors and cyclone draught to the kilns, the amount of fuel being regulated by the speed of the extractor conveyors. There are two conveyors,

one for each kiln, driven by 5 h.p., 720/360 r.p.m. variable speed slip-ring motors arranged for speed control by means of rotor resistance.

The firing fans, which are of the high pressure type, inject the powdered coal into the kilns and are driven by direct coupled motors. Each motor is 35 h.p. and of the variable speed slip-ring type, being designed to give a speed range between 1,425 and 720 r.p.m. At the cool end of each kiln there is an induced draught fan direct coupled to a 60 h.p. variable speed slip-ring motor, having a speed range between 360 to 575 r.p.m., and these two fans exhaust the gases into the base of the chimney.

An important feature of this portion of the plant is the provision made for dust extraction, which is carried out in this case by Lodge-Cottrell electrical dust precipitation plant. The process consists fundamentally of passing the dust-laden gas between two oppositely charged electrodes, one of large area, termed the collecting electrode, and the other of smaller area known as the discharge electrode. The discharge electrode is insulated from the treater and earth, and connected to a 60,000-volt supply. The collecting electrode is earthed. As the dust-laden gases pass into the treater the majority of the material particles acquire a polarity similar to that of the discharge electrode, and are, therefore, repelled from it and attracted to the collecting electrode and precipitated on its walls. A small proportion of the particles cling to the electrodes, and are eventually removed by rapping, the rapping operation being carried out by motor operated hammers.

This treatment of the gases serves the double purpose of preventing the pollution of the atmosphere and of saving the product, for the dust thus collected is carried back and fed into the kiln with the slurry.

Returning to the cement making and handling processes, the clinker from the coolers falls on to one or other of two shaker conveyors, each of which feeds a set of 24-in. diameter × 18-in. wide crushing rolls. Two 20 h.p., 720 r.p.m. high torque squirrel-cage motors are utilized for driving the rolls and conveyor, each motor driving one set of rolls and one shaker conveyor through countershafting. The motors are controlled by means of oil immersed auto-transformer starters.

From the rolls the clinker is discharged into one or other of two vertical bucket elevators, which are each driven by a 10 h.p. squirrel-cage motor arranged for direct switching on to the line. These elevators carry the clinker to an automatic tipping weighing machine which gives the quantity of clinker fed into the store, the capacity of which is 15 tons per hour. The weighing machine discharges on to a troughed band conveyor 20-ins. wide by 230-ft. long, which runs over the full length of the clinker store. This conveyor is driven by means of a 15 h.p., 725 r.p.m. high torque squirrel-cage motor controlled by an auto-transformer starter.

In the floor of the clinker store is a series of twenty hoppers, which project downwards into a concrete tunnel extending the full length of the store. A troughed band conveyor 20-ins. wide by 232-ft. long operates along the tunnel and the flow of clinker from the hoppers on to this conveyor is regulated by means of adjustable swinging chutes. This conveyor, which delivers the clinker to an elevator, is driven by a 15 h.p., 725 r.p.m. high torque squirrel-cage motor, controlled by an auto-transformer starter. The elevator into which the conveyor feeds is driven by a 10 h.p., 725 r.p.m. motor controlled by a direct-on starter, and this elevator discharges on to a further troughed band conveyor 20-ins. wide by 200-ft. long, driven by a 15 h.p., 725 r.p.m. high torque squirrel-cage motor. This latter conveyor transfers the clinker from the elevator in the clinker store to an automatic weighing machine of the hopper type situated above the clinker bunkers in the cement mill, which indicates the quantity of clinker taken from the store. The clinker, after being weighed in the automatic machine, is deposited on to a flat belt conveyor which delivers the clinker into three reinforced concrete clinker bunkers. The conveyor is driven through worm reducing gear by a 7½ h.p. 725 r.p.m. squirrel-cage motor.

It is at this stage of the process that the gypsum is added, and a crusher 20-ins. × 6-ins. is provided to deal with the gypsum. After crushing, it is carried by a vertical bucket elevator, driven through worm reduction gearing by a 10 h.p., 725 r.p.m. squirrel-cage motor, to the top of the concrete bunkers, where it is delivered into the bunkers by a flat belt conveyor 20-ins. wide × 54-ins. long. The gypsum crusher and conveyor on top of the bunkers are operated by a 20 h.p., 725 r.p.m. high torque squirrel-cage motor controlled by means of an auto-transformer starter.

Under the clinker and gypsum bunkers there are feed tables through which the materials are fed into three compound ball and tube mills, each 6-ft. 6-ins. diameter × 36-ft. long. These mills are driven by motors exactly similar to those for the ball and tube mills, which grind the limestone and clay together, *i.e.*, 475 h.p., 750 r.p.m. synchronous induction motors, and as previously stated these motors are utilized for power factor correction. The cement from these mills discharges into either of two conveyors, each driven by a 7½ h.p., 725 r.p.m. squirrel-cage motor operated by a direct-on starter. These conveyors pass the cement into two 18-ins. × 55-ft. vertical bucket elevators driven by two 10 h.p., 725 r.p.m. squirrel-cage motors, and the elevators carry the cement to two worm conveyors, 18-ins. diameter × 27-ft. long, which take the cement across a gantry over a roadway. These conveyors are driven through worm reduction gearing by two 7½ h.p. motors controlled by direct-on starters. From these conveyors the cement passes to two further bucket elevators which take the cement to the top of the storage silos. These elevators, each of which is driven by a 15 h.p., 730 r.p.m. high torque squirrel-cage motor started by auto-transformer starter, discharge on to either of two worm conveyors which run over the whole length of silos. Each worm conveyor is provided with suitable outlets to unload the cement into any one of the silos. These worm conveyors are driven by similar motors to those just mentioned for the elevators.

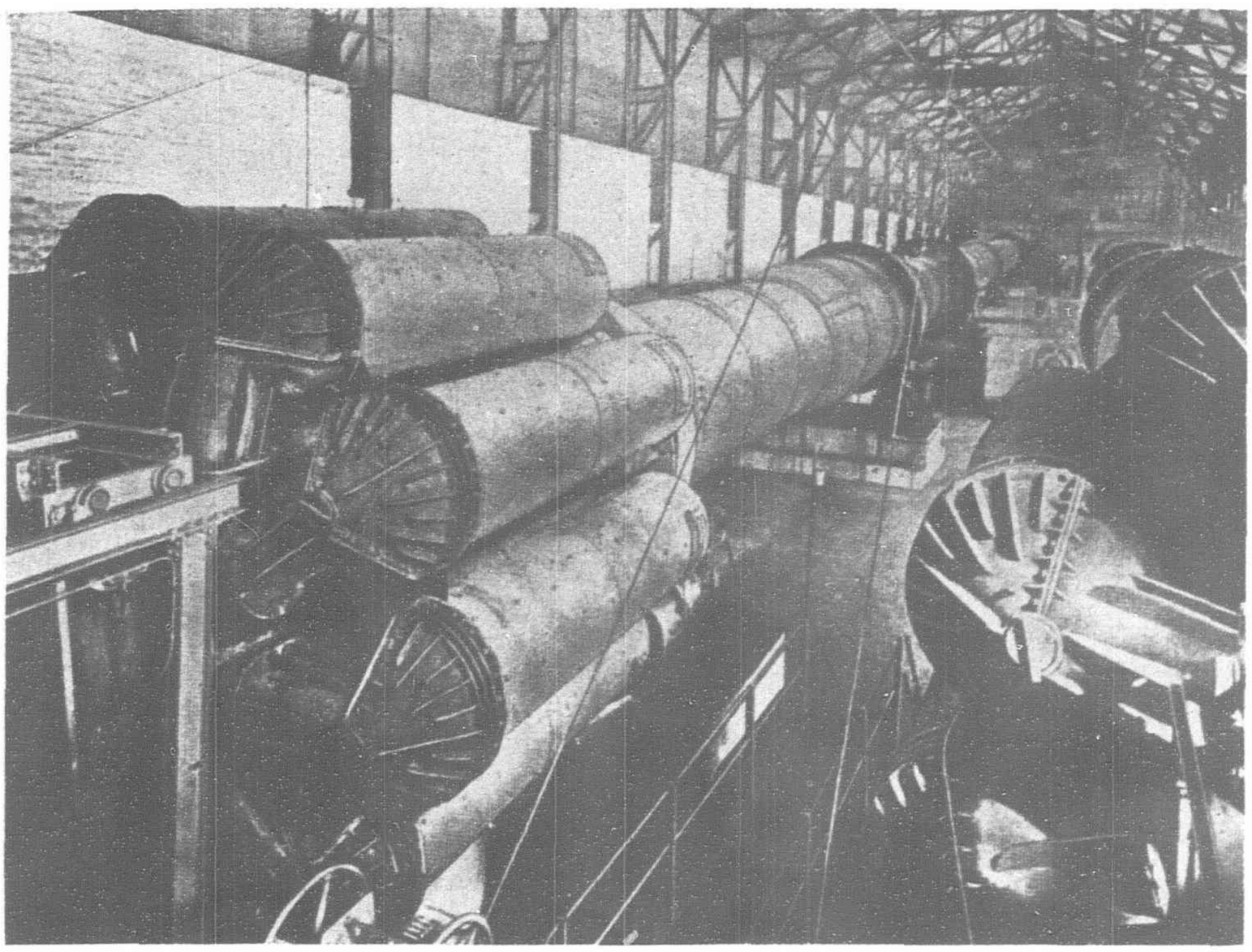


Fig. 3.—A General view of the Kiln House

The cement from these silos is fed on to worm conveyors driven by 10 h.p., 730 r.p.m. squirrel-cage motors arranged for switching direct on the supply. These conveyors feed into two cross-worm conveyors driven by 7½ h.p., 730 r.p.m. squirrel-cage motors and they in turn discharge into two totally enclosed vertical bucket elevators, each driven by similar type of motors, 10 h.p. capacity. These elevators discharge the cement into four reinforced concrete packing hoppers. Under each hopper is a set of double extracting screws driven by 5 h.p., 725 r.p.m. motors of the squirrel-cage type. From these screws the cement is packed into bags or barrels.

A well-equipped workshop enables repairs of a major character to be carried out in the shortest time, so that every means is available

for ensuring undisturbed operation of the very extensive plant. The machinery in this workshop is driven by two 20 h.p., 720 r.p.m. high torque squirrel-cage motors.

So much for the general outline of the process and methods adopted by the Green Island Cement Co., and it is now intended to deal more fully with the electrical portion of the equipment. Reference has already been made to the majority of motors during the description of the process, but it will be of general interest to enlarge on this.

Details of the electricity supply will be given later and it is sufficient to state here that alternating current is utilized so that a.c. motors are installed throughout, this type being especially suitable on account of simple design and robust construction. The conditions in Cement Works are such that the motors usually have to run in an atmosphere which contains a certain amount of dust. Furthermore, the motors situated near the kilns and the coolers have to operate in the presence of considerable heat. In a few cases the motors may be mounted in the open and need protection from the weather. All these points, together with others, were kept in mind when deciding on the type of motors and control-gear to install. It was decided to utilize the ordinary protected type in practically every case, and provision is made on site for blowing out periodically by means of compressed air, and all motors are suitably protected on site against weather. Ball or roller bearings are fitted to all, except the 475 h.p. mill motors, as this type is preferable for service in Cement Works, needing only a minimum of care and attention. For the 475 h.p. size ring lubricated end shield type bearings have been adopted, consisting of cast iron housings lined with best quality white metal, lubrication being carried out on the ring principle, two rings being used in each bearing so arranged as to dip in oil reservoirs of generous capacity. The mill motors, it should be noted, are placed in a separate room and completely partitioned off from the cement mills, as will be seen by reference to Fig. 2.

All motors of 30 h.p. and over are of the slip-ring type with the collector rings totally enclosed in dust-proof enclosure, while constant speed motors below 30 h.p. and over 10 h.p. are of the high torque squirrel-cage type. It will have been gathered from the description of the process that the crushing and grinding machinery, mixers, pumps, elevators and conveyors, etc., operate at constant speed, whereas the rotary kilns, firing fans and feeders are driven by motors provided with rotor resistances for speed regulation.

Belt drives have been eliminated as far as reasonably possible by arranging the motors to drive the machinery through suitable speed reducing gears, thus making for neatness, compactness and reliability.

The control gear is of the oil-immersed ironclad type, arranged to trip open on overload and failure of voltage. In the majority of cases the control gear is arranged for mounting separately, but in certain sections of the Works the various starters have been grouped together for convenience, and in such cases they are supplied complete with bus-bars and isolating switches and mounted in switch-board form.

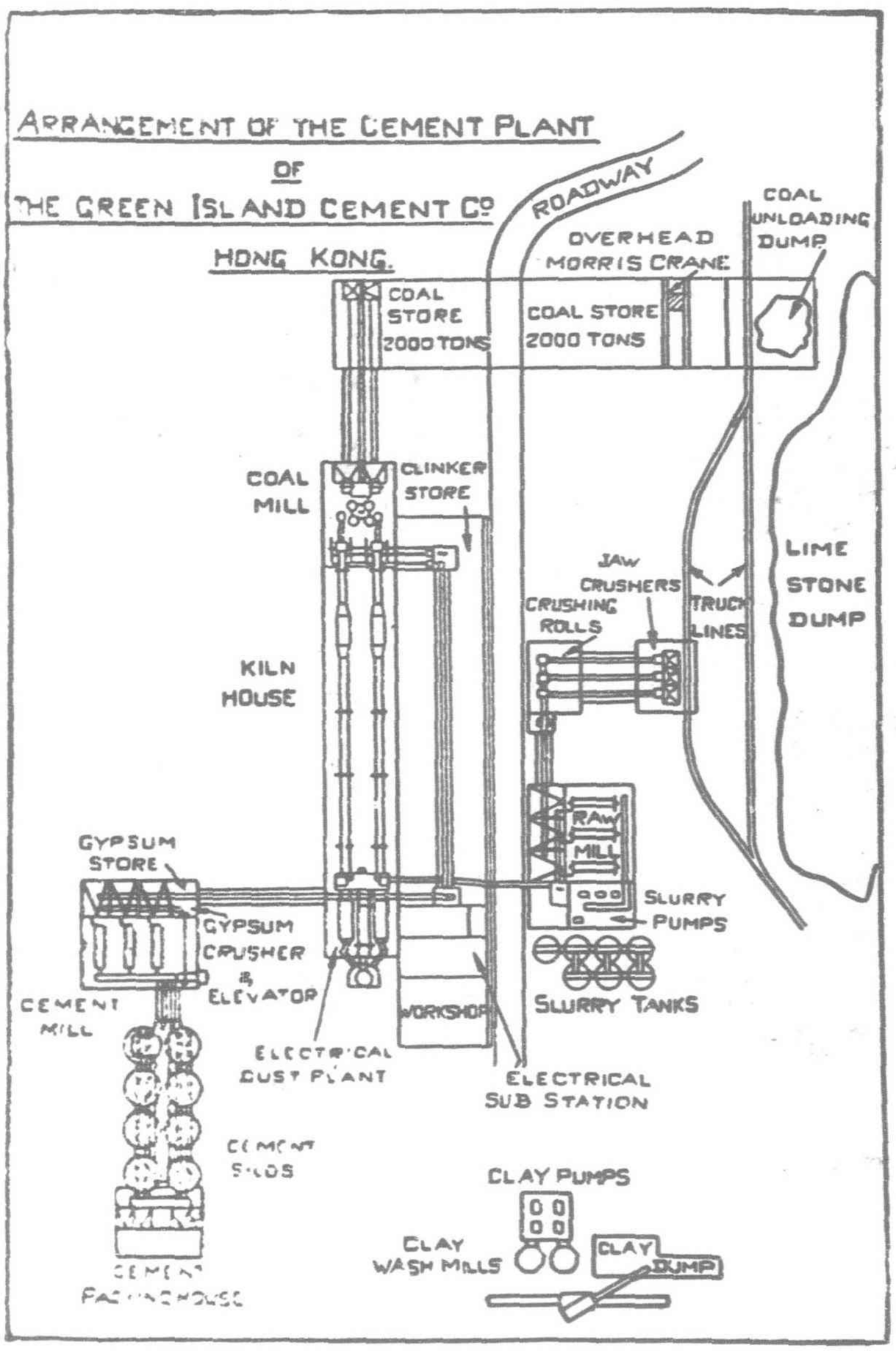


Fig. 4.—Diagram of arrangement of Plant

The variable speed motors are provided with rotor resistances and drum controllers in addition to circuit breakers, and an interlocking arrangement is incorporated in each unit to prevent incorrect operation. Constant speed slip-ring motors have circuit breakers and oil-immersed or liquid type rotor starters.

The squirrel-cage motors over 10 h.p. are controlled by means of auto-transformer type starters, while smaller motors have starters of the direct-on type.

Many of the machines employed are of a very heavy nature, representing large masses to be accelerated, and in addition the static friction of the bearings of these machines is considerable, therefore it is essential to choose carefully the most suitable type of motor and starter for each individual drive. These remarks, of course, apply particularly to the crushing and grinding machinery and the kilns, and special attention had to be given to this point when choosing the size and capacity of the rotor starters.

Special Requirements

The stator switches for the kilns, fans and extractors are built up together to form two combination distribution control boards (one for each kiln), both of which are mounted on the firing platform. The controllers are also mounted on the platform in close proximity to the corresponding stator switches for the motors they control, and it will be appreciated that by doing this it is possible to control all these motors from the platform. The operator has full control of these drives and can thus vary the speed of the kiln and its feed to suit the quality and quantity of clinker desired.

Push buttons are arranged in convenient positions for those motors controlled from the firing platform, so that in case of emergency the motors can be shut down at a position remote from the operator's platform.

Sequence Interlocks

In order to avoid any possibility of congestion of material taking place in the Raw Material Crushing Section it was decided to provide a sequence interlock between the various motors driving the crushers, rolls, elevators and conveyors. With this interlock it is only possible to start the machinery in correct sequence, and if one machine stops for any reason then those before it in the process also stop, thus preventing heaping up of material. In a similar way other elevator and conveyor motors are interlocked elsewhere in the Works.

Power Factor Correction

It is in the interest of both consumer and supply authority to maintain the power factor as high as reasonably possible. An a.c. induction motor gives its highest power factor when working at its maximum rated load, and this falls off considerably when it is working on half load or below. This variation calls for the grouping of machines and the sizes of motors in such a manner that they all work as nearly as possible at their rated maximum

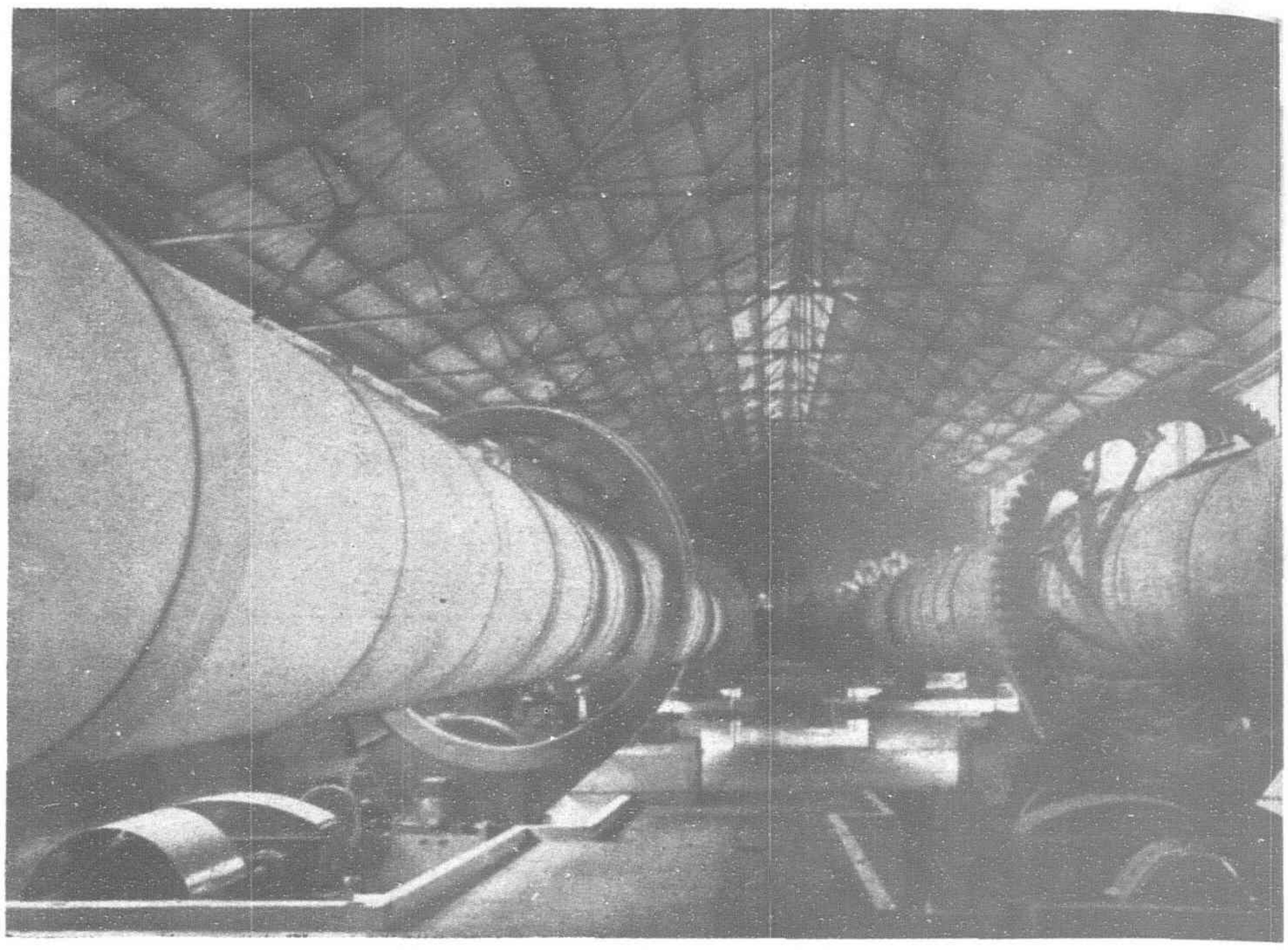
capacity. By taking such precautions the normal power factor of plant in a cement works may be maintained at as high a value as is possible without the use of special apparatus. For the Green Island Cement Company the restriction was made that the overall power factor of the system must be maintained at approximately .95 lagging power factor, which, of course, necessitated the embodiment of some form of corrective apparatus. It was decided to make use of the 475 h.p. Raw and Cement Mill motors for this purpose, and consequently motors of the synchronous induction type (sometimes known as auto-synchronous) have been adopted.

It is interesting to note that the Metropolitan-Vickers Electrical Co. has played a pioneer part in the development of this particular type of motor, which consists virtually of a slip-ring induction motor provided with a direct current exciter. It combines in one machine the advantages of both the slip-ring induction and synchronous types of motor, possessing the heavy load low current starting characteristics of the former with the valuable property possessed by the latter of running at unity or leading power factor. This type of motor is ideally suited to the service under consideration, and it cannot be said that it is much more complicated or requires more skilled attention than an ordinary slip-ring motor. The control gear is precisely the same as for the slip-ring motor, consisting of circuit breaker with the usual protective devices and interlocked rotor starter. The motor is started up in the usual manner as an induction motor by closing the main switch and gradually cutting out the starting resistance. While running up to speed the exciter builds up the magnetizing current, and on approaching full speed the motor pulls automatically into synchronism.

In order to comply with the requirements and provide the necessary leading kva. to correct for the external load and correct the overall power factor of the system to approximately .95 lagging the six 475 h.p. motors are designed to operate at unity power factor. The type of machines are clearly shown in Fig. 2, and it will be seen that the slip-rings are situated inside the yoke between the bearings, while the exciter armature is overhung and the exciter yoke is mounted on an extension of the end shield. The units are extremely neat and compact.

Power Supply and Distribution

Power is brought into the Works by the China Light and Power Co., Ltd., whose station is adjacent to the Works—the system being 6,600-volts, 3-phase, 50-cycles. Duplicate mains are brought into the Cement Works substation and each controlled by a type "K2A" oil immersed circuit-breaker mounted in sheet steel cubicles. These cubicles also carry the isolating switches, current and potential transformers, etc., and together with a metering and spacer panel are the property of the Supply Company. The spacer panel is provided so as to facilitate the later splitting of the bus-bars and to accommodate the future cable boxes taking cables to reactors, which will be installed to afford the necessary protection to the Cement Works equipment when the capacity of the Supply Co.'s station is increased. The two main incoming feeder panels are equipped with directional and overload protection, and access to the interior of the cubicles is obtained by means of hinged lockable doors at the rear. The Supply Co.'s switchgear is lined up with four additional sheet steel cubicles which are the property of the Green Island Co., and the whole forms one complete switch-board. These latter four cubicles control outgoing feeders to transformers and are equipped with type "BBH" automatic loose handle oil immersed circuit-breakers.



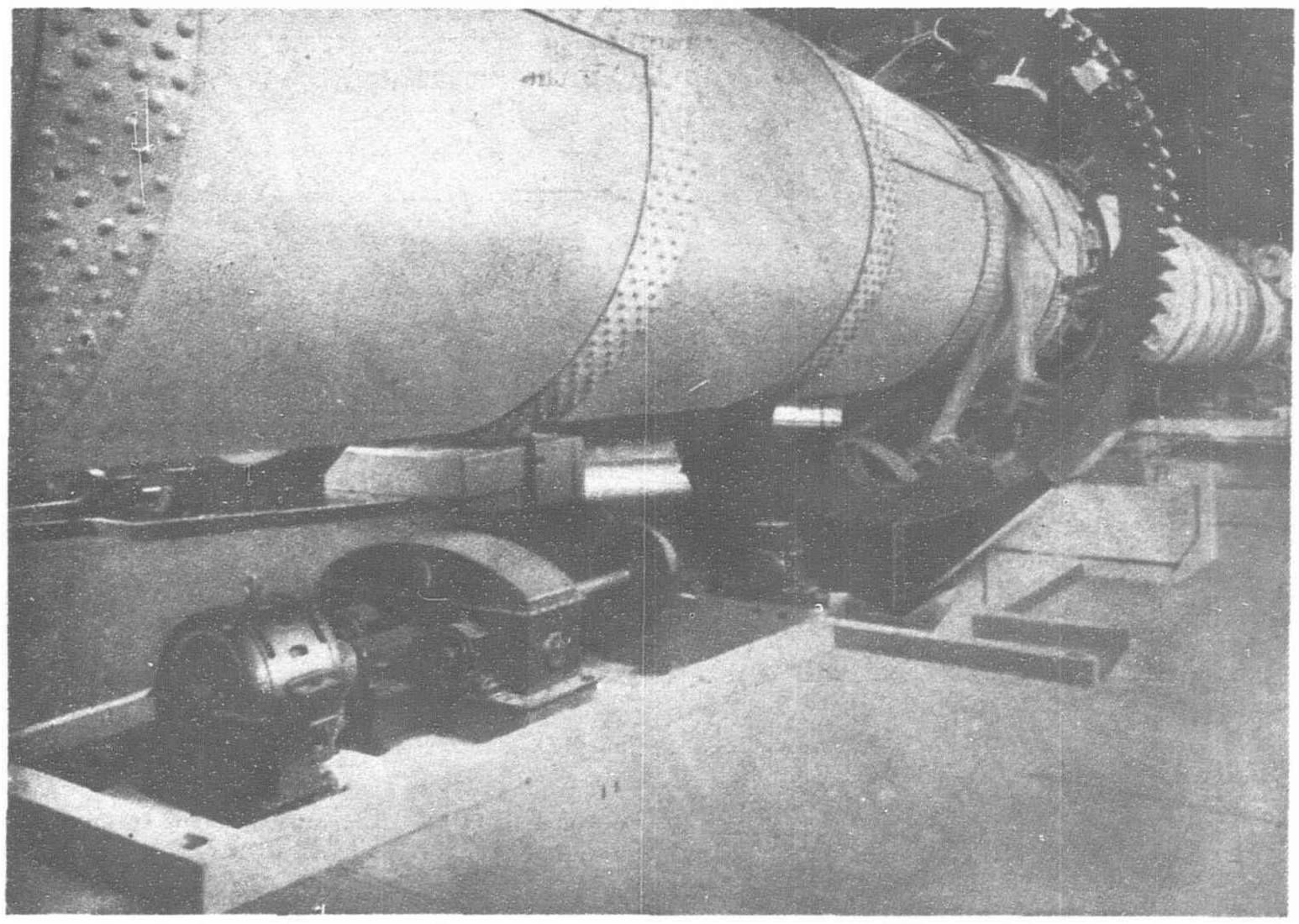
A Typical view of Two Cement Kilns. They are driven through Double Reduction Gearing by Metrovick 3-speed squirrel Cage Motors developing 85/70/35 h.p. at 730/580/365 r.p.m. respectively.

This switchgear is located in the Works substation and in this same station the transformers are housed together with 2,200-volt and 350-volt switchgear. The overall dimensions of the station are 42-ft. × 70-ft., and the various equipment has been laid out to the best advantage and provided with suitable trenches to accommodate the cables between each piece of apparatus.

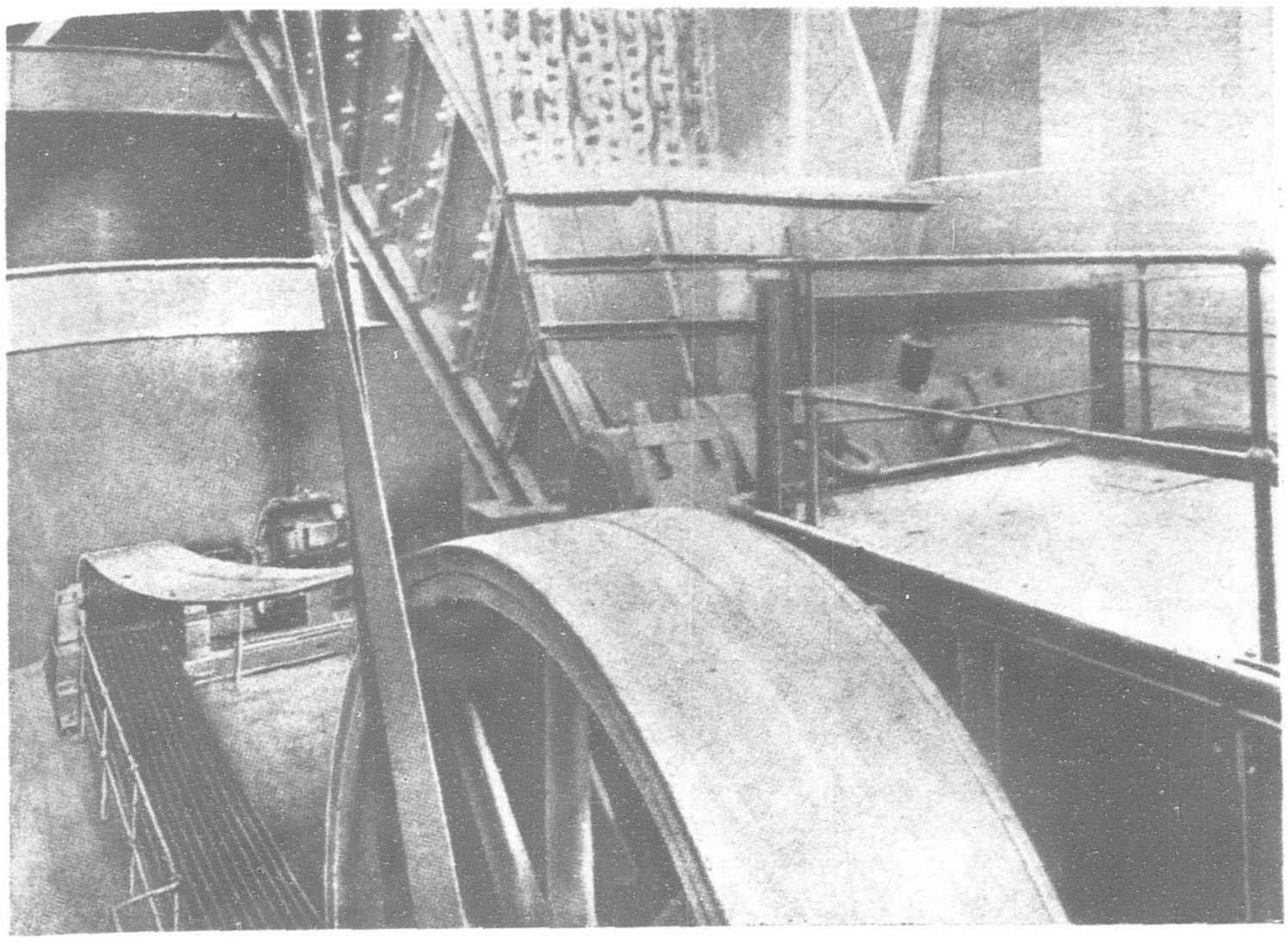
The stand-by engine alternator set installed so that in the event of a failure of supply the kilns may be kept turning and one compressor in operation for the supply of air for slurry and clay agitation is also housed in this station.

It was decided to supply the six 475 h.p. motors at 2,200-volts and for this purpose three 1,200 kva., 6,600/2,200-volt transformers are installed. One transformer acts as a stand-by and the two in service have their high tension windings controlled by the cubicles already referred to and the secondary windings are controlled from a four-panel sheet steel cubicle board—the remaining two panels control outgoing feeders to each of two 3-cubicle boards, which control the Raw Mill and Cement Mill motors and these are mounted in their respective mill houses. The cubicles are generally similar to those described for the 6,600-volt board.

All the remaining motors are supplied at 350-volts and three additional transformers, each



A closer view of the arrangement of the Kiln Drive described in title of previous illustration



A Limestone Jaw Crusher 72 inch by 48 inch by Vickers-Armstrongs, said to be largest in the World. It is in the same Cement Works as Kilns shown above and is driven by a Metrovick 250 h.p., 3.000-volt motor.

900 kva. capacity are installed in the substation for this purpose. The low tension side of each transformer is controlled by one panel on the 17-panel flat-back type switch-board. This board is equipped with type "BL" or "BBH" oil immersed circuit-breakers, isolating switches, current transformers, etc., and controls feeders to each section of the Works, as follows :—

Panel No. 1—Clinker Store and Air Swept Coal Plant.
" " 2—Cement Silos and Packing House.
" " 3—Cement Silos and Cement Mill House.
" " 4—Firing Platform for Kiln No. 1.
" " 5— " " " " " " 2.
" " 6—Air Swept Coal Mills.
" " 7—Crane.
" " 8—Clinker Store and Kiln House.
" " 9—Raw Mill Crushing House.
" " 10—Crusher House.
" " 11—Pump House and Sand Store.
" " 12—Clay Washmills.
" " 13—Machine Shop and Air Compressors.

This board also comprises panels for the main lighting circuits and stand-by alternator.

The various Works feeders are taken to either group control boards or distribution fuse boards where the circuit is split up to the motors. Ironclad triple pole distribution fuse boards with cartridge type rewireable fuses are utilized throughout.

Metering Arrangements

All the feeder panels are equipped with poly-phase integrating watthour meters of the semi-switch-board type, so that separate records can be kept of the units consumed by each section of the Works. This will enable any irregularities in power or any small inefficiencies to be readily seen and investigated and corrected by the Mill Manager, thus maintaining the overall efficiency of his Works at a high value.

Ammeters scaled in amperes and horse-power are fitted to all motor control pillars above 10 h.p., which will indicate any serious overload and possibly enable this to be checked before any damage is done to the motors.

Power Transformers

The power transformers are each of the oil-immersed, self-cooled indoor core type, having plus and minus 2½ and 5% tappings on the high tension side brought out to three single phase off load externally operated tapping switches. They are of the three phase type having the neutral point brought out on the secondary side. Each transformer is contained in a boiler iron tubular tank, fitted with the usual accessories and complete with calcium chloride breather and oil conservator.

Cables

Paper insulated lead covered wire armored cable has been used practically throughout the installation with the exception that from the distribution fuse boards and motors below 50 h.p. vulcanized india rubber armored cable has been utilized.

Lighting

The whole of the Works lighting equipment was supplied and installed. The main switches and fuse boards are all of the ironclad type and the wiring is chiefly carried out in vulcanized india rubber cable run in conduit. The lighting circuits are connected between phases and neutral at 230-volts.

Acknowledgment

The writer would place on record his thanks to Mr. Pooley, Consulting Engineer, for permission to publish this article and for his assistance in dealing with the description of the process adopted by the Green Island Cement Co. The account given herein is of necessity brief, and for a more detailed description the writer would suggest that reference is made to Mr. Pooley's excellent article, which was concluded in the December, 1932, issue of *Cement and Cement Manufacture*.

Singapore's Civil Aerodrome

The preparation of the site which is to bring Singapore into line with air ports of the world is the biggest reclamation scheme ever undertaken in the island. Nearly four hundred acres of tidal mangrove swamp will be reclaimed. The landing ground will be a thousand yards across, and there will be hangars, administration offices, customs office and quarantine buildings grouped at the north-west side of the ground. There will also be seaplane sheds and a slipway. A channel will be dredged on the west side of the landing ground which will make it possible for the biggest of seaplanes to use the air port. To facilitate drainage, the landing ground will rise slightly to the center, and by means of a scientific arrangement of drains it will be possible for the landing field to be entirely free of water within one hour after the heaviest of rainstorms. By night a beacon light will show the air traveller where he is, and landing lights will guide him to a safe landing. It is unlikely that an airship mooring mast will be part of the equipment of the aerodrome, unless some new developments in that type of aircraft encourage the British Air Ministry to take it up again. The development of the air port of Singapore has already been taken in hand, and letters have been written to all the great aerial transport organizations soliciting their views as to the type of accommodation that would be desirable.

Good progress has been made with the work during the eighteen months since the first sod was cut in September, 1931. Heavy work was involved after that in making the railway line which conveys the earth from the quarry to the site. The embankment for the railway had to be carried across the middle of a wide area of swamp land. Filling commenced on May 8, last year, and since then close on thirty acres have been filled in, half a million cubic yards of earth being used. Now the method is to build dams out into the swamp. By means of a sluice gate the dam is drained off at low tide and the mud left dry. Filling can then go on. Another three years will elapse before the completion of the filling. If necessary it could, no doubt, be used as an emergency landing ground much earlier than that.—*Eastern Engineering and Commerce.*

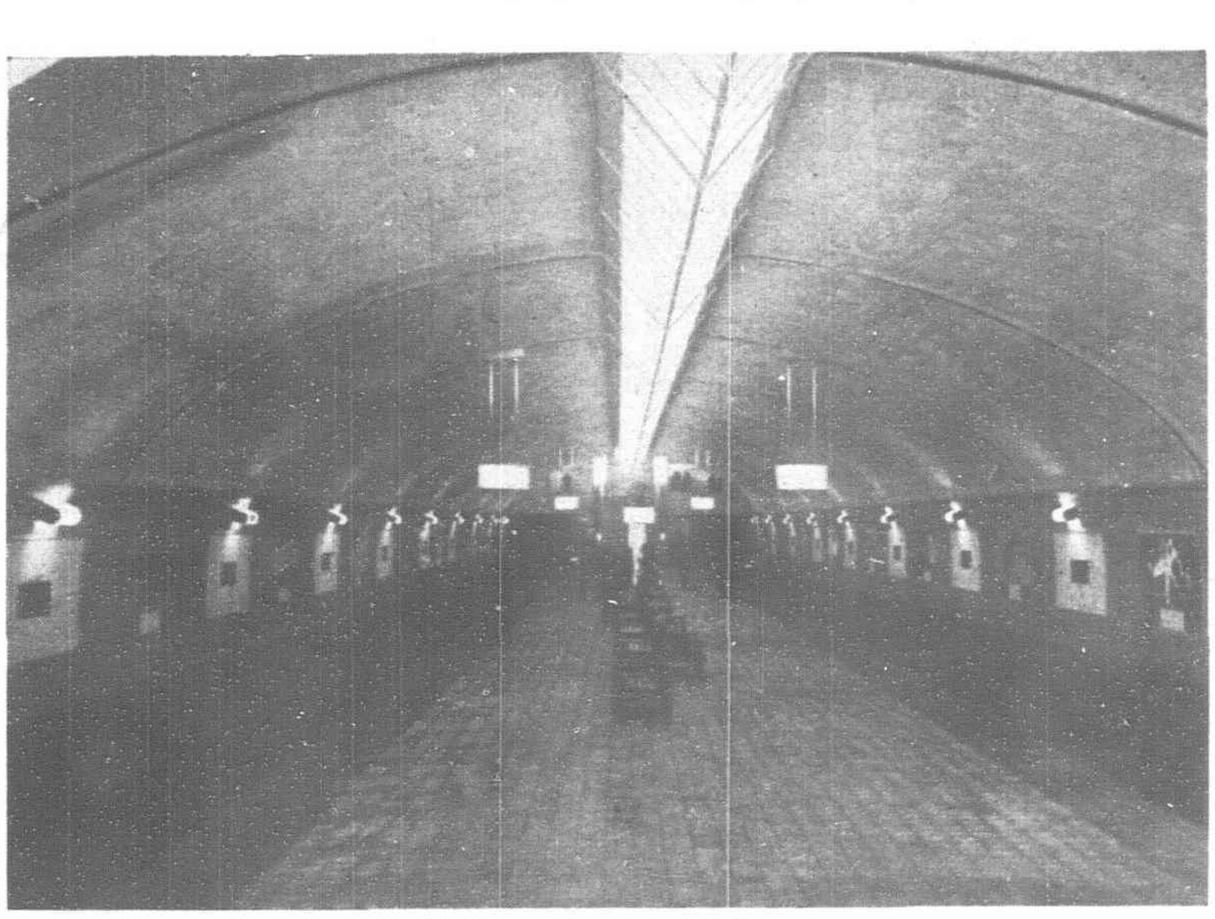
Osaka's New Rapid Transit Line

By W. HARVEY CLARKE, JR.

INTERSECTED by a number of rivers and spreading out along a landlocked bayfront, the industrial metropolis of the Far East, Osaka, is not infrequently termed the "Pittsburg" or "Manchester" of the Japanese Empire. Being a populous city as well as the major commercial center of western Japan, its industrial activities embrace diverse fields of business enterprise. With its series of busy boat canals spanned by a wide variety of bridges, Osaka has been called sometimes the *City of Canals and Bridges*. Many of these bridges have long been known for their architectural beauty.

At one period in its history, Osaka was the Imperial Capital of Yamato (Old Japan), and later, in the year 1585, Hideyoshi Toyotomi, a powerful feudal chieftain, caused an impregnable fortress to be reared within the city's borders, thereby aiding in no small measure to establish Osaka as a future economic center of unquestioned importance. A castle tower, reputed to be typical of ancient Japanese castle architecture, still stands as an interesting relic to reflect the glory of those bygone days.

In order to facilitate metropolitan traffic movement, the Osaka Municipality in 1903 began the operation of a street railway system, and during the past thirty years, succeeding city administrations have extended its trackage and added to the equipment of a network of tramway lines. Within the short space of a quarter of a century Osaka has undergone such rapid development and growth that the 104 kilometers of double-track street car lines, many of the city-owned as well as private bus lines, and the ubiquitous cruising taxicab, in evidence almost anywhere one goes, do not serve adequately to fulfil the multiplied traffic demands of an ever increasing number of inhabitants.

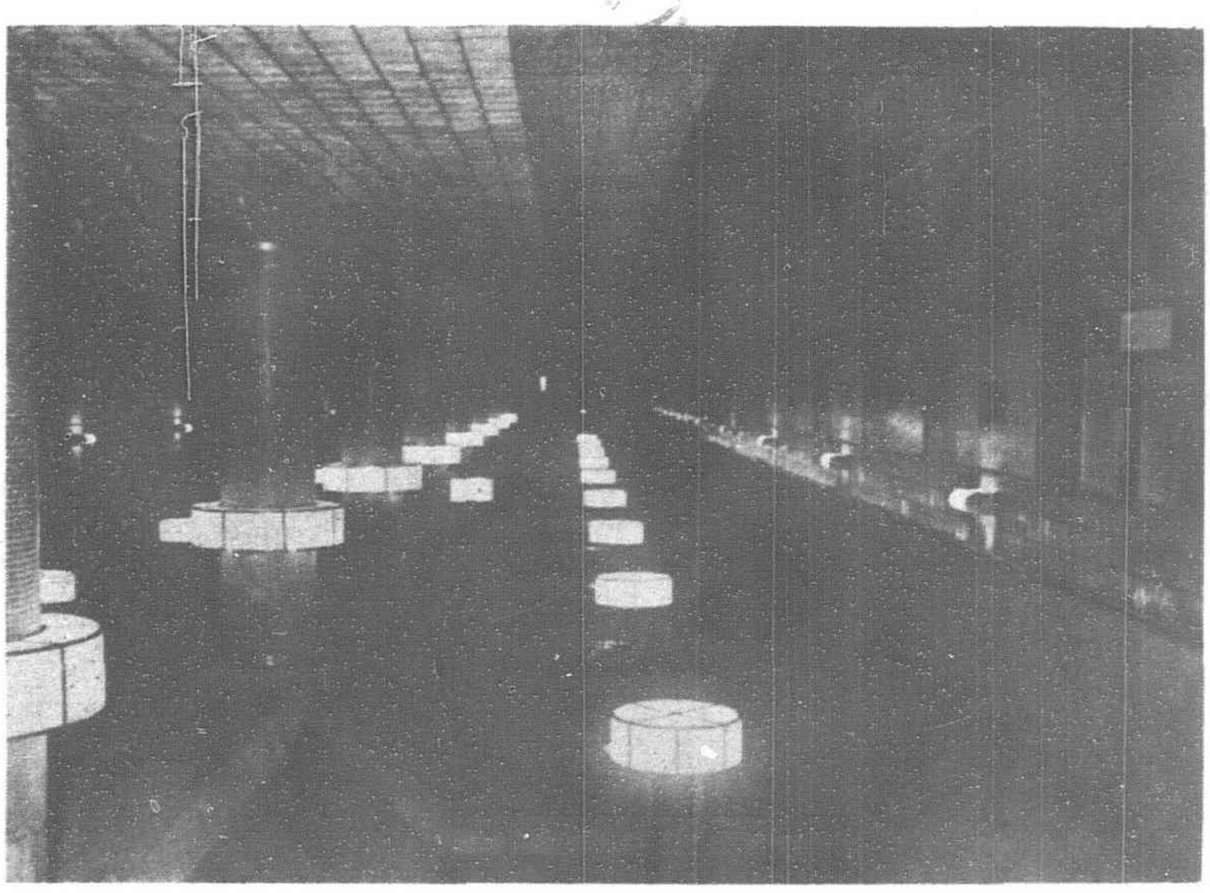


Yodoyabashi Station Island Platform with tracks on both sides, arched vault and walls covered with terra cotta displaying posters and station name plates. Platform illuminated by Center Trough Light

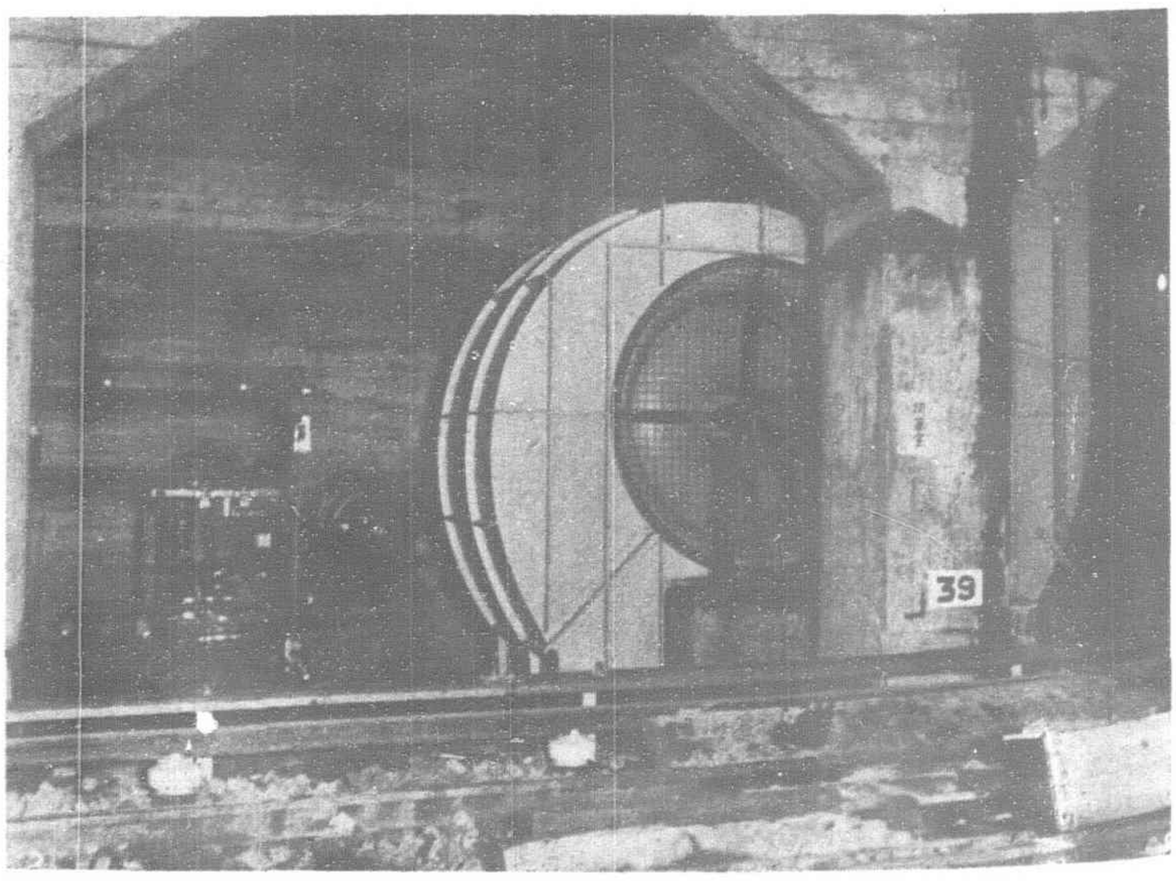
Special Study of Traffic

Since 1918 the incorporated territory of Osaka, which to-day has a population exceeding some 2,500,000, has had a permanent investigation committee, whose duty it is to draft plans to meet the future needs of the metropolitan area. Several years ago this committee made a special study of requirements for a rapid transit railway system, and discussed the problem of present-day traffic conditions as well as what influence the maintenance of a completed rapid transit system would have upon the existing traffic congestion. Ultimately in 1927, at a meeting of the Imperial Railway Society and Civil Engineering Association, construction by the Osaka Municipality of four connecting lines to traverse the city was decided upon. These lines, when in operation, will consist of subways radiating from the central part of the city and elevated right-of-ways in suburban areas,—all to cover a total length of 54 kilometers and to be built at an estimated construction cost of Y.162,300,000 derived from flotation of a public loan.

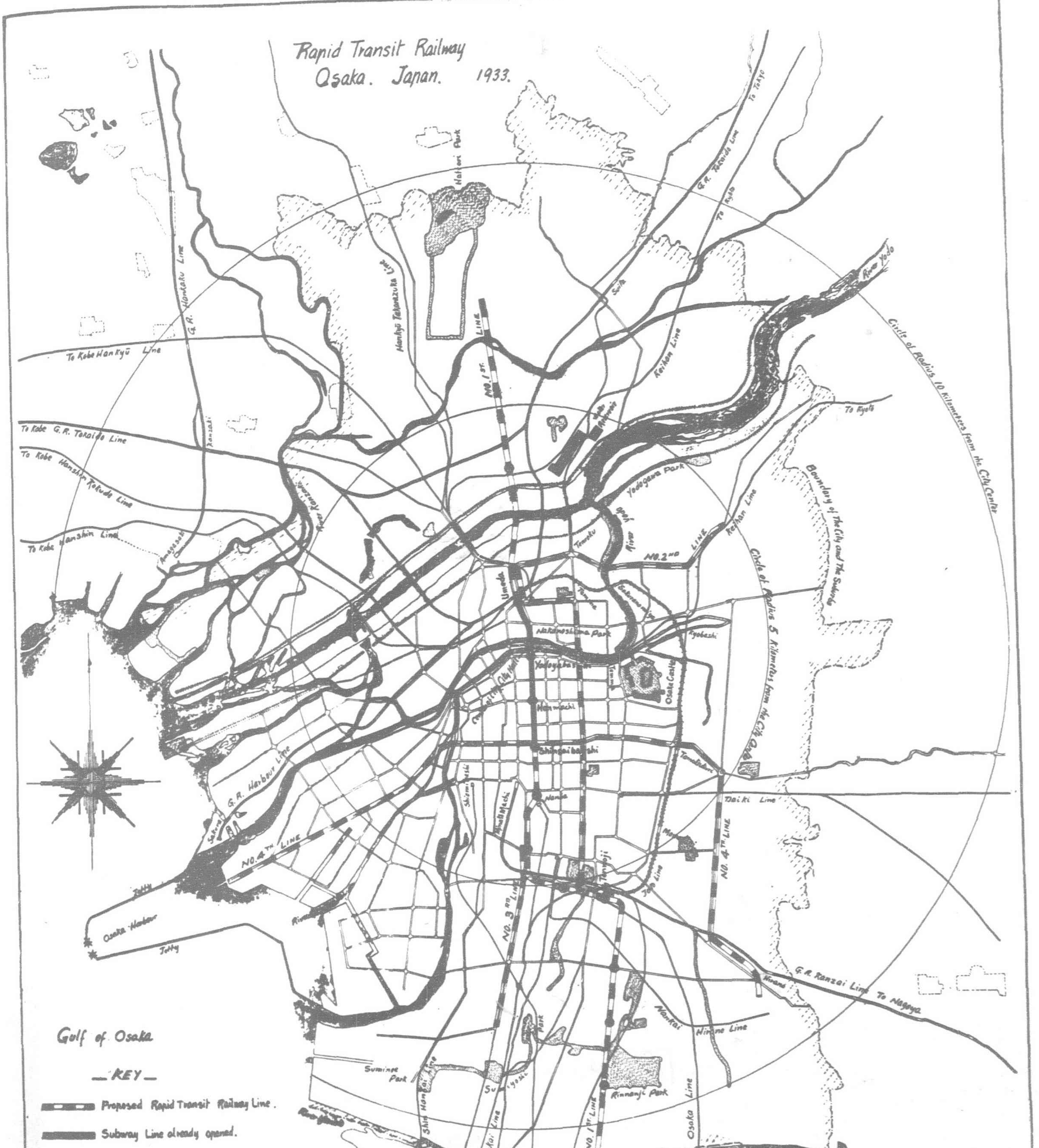
The cities of Kyoto and Nara, both distant about 25 miles from Osaka, are also ancient capitals of Japan. The vicinities of these two cities in the Kwanto region are rich in historic associations with the early life of the Empire. Literally hundreds of temples and shrines still remain in different localities to attest the vigor of its religious life. Kobe, one of Japan's great seaports and marts of international as well as domestic commerce, is about 19 miles from Osaka and commands nearly all the trade in western Japan. Osaka therefore has several direct railway routes to these three key cities, not only for business purposes but also to accommodate tourist travel.

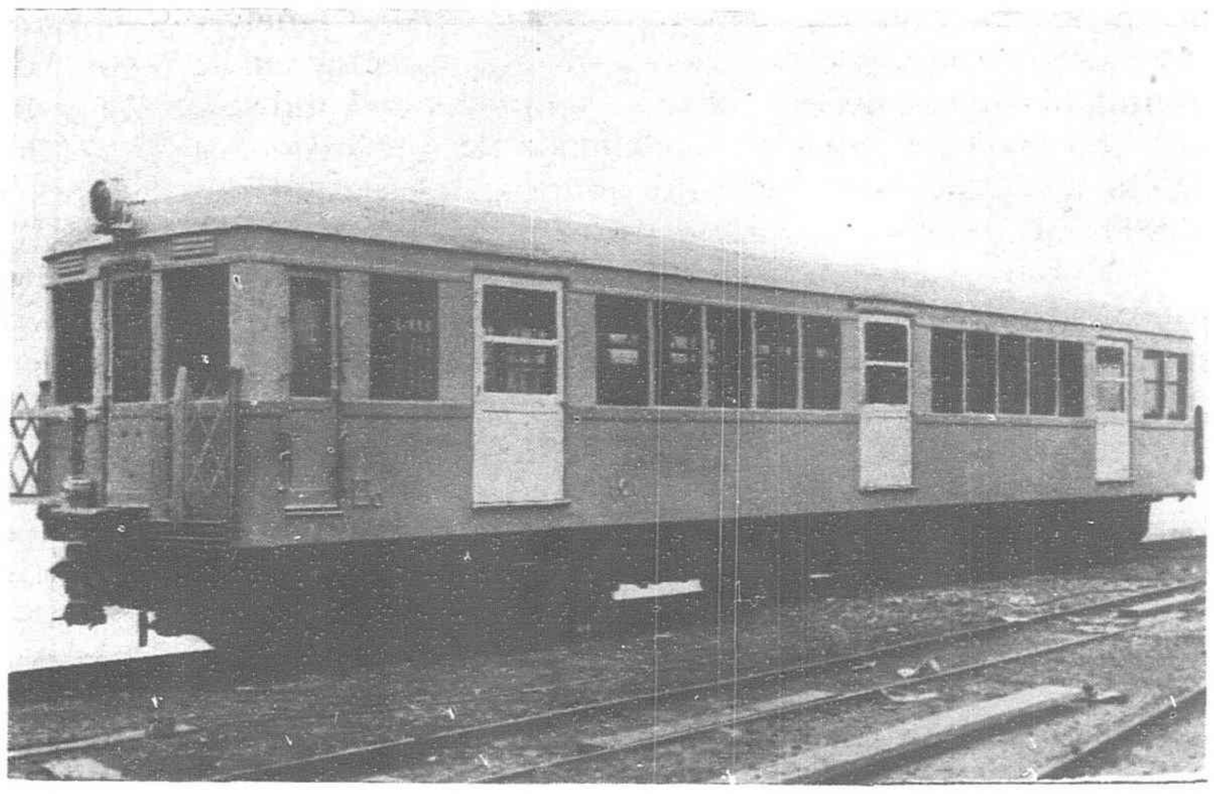


Honmachi Station Island Platform with running tracks on both sides

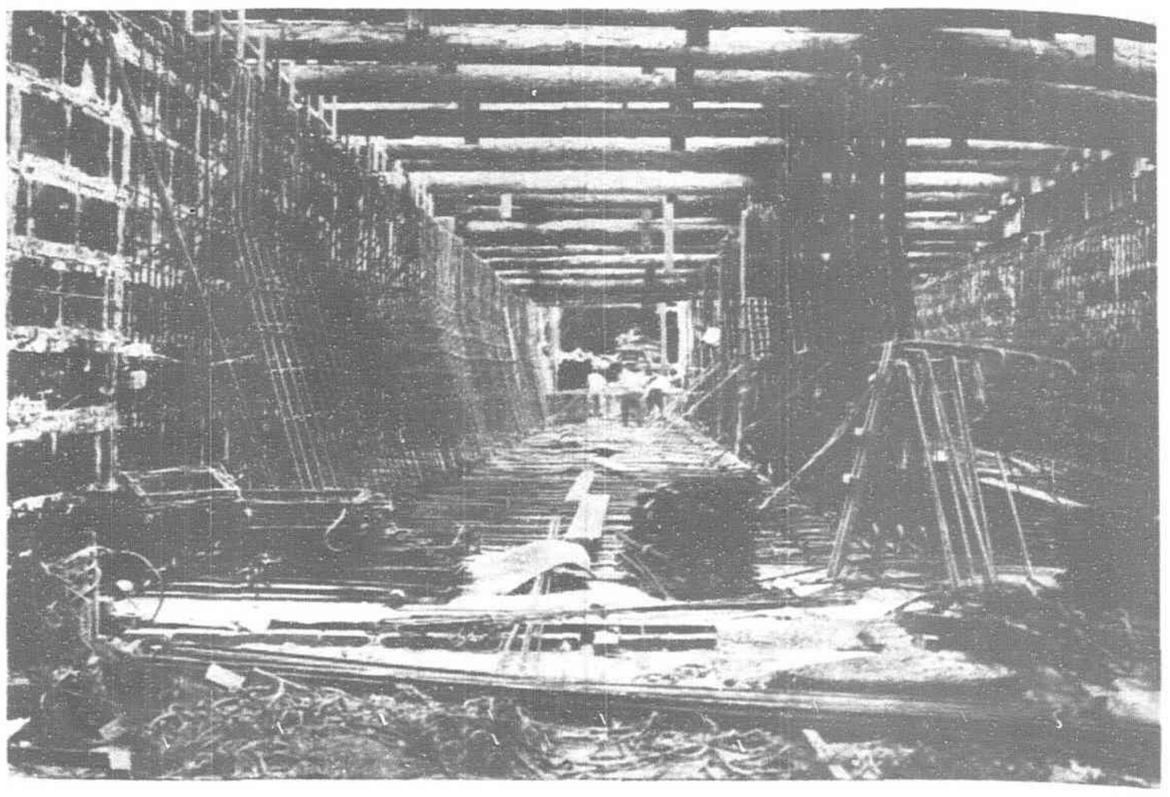


Suction Fan installed to ventilate Osaka Subway Tunnel


Rapid Transit Railway
Osaka. Japan. 1933.
Hattori Park
Hankyū Takarazuka Line
G.R. Tokaido Line
To Tokyo
To Kyoto
Suita
River Yodo
Keihan Line
Circle of Radius 10 Kilometers from the City Center
To Kobe Hankyū Line
G.R. Honkaku Line
NO. 1 ST. LINE
To Kyoto
To Kobe G.R. Tokaido Line
To Kobe Hanshin Rokudo Line
Kanzaki
River Kanzaki
Yodogawa Park
To Kobe Hanshin Line
Amagasaki
River Yodo
Tenroku
NO. 2 ND LINE
Keihan Line
Boundary of the City and the Suburbs
Circle of Radius 5 Kilometers from the City Center
Umeda
Nakanoshima Park
Kyobashi
Yodoyabashi
Osaka Castle
Honmachi
Shinsaibashi
Tamatsukuri
G.R. Harbour Line
Shiomibashi
Namba
Daiki Line
NO. 4 TH LINE
NO. 4 TH LINE
Tennoji
Jyoto Line
Jetty
Osaka Harbour
Jetty
NO. 3 RD Line
G.R. Kanzai Line To Nagoya
Hirano
Nankai Hirano Line
Gulf of Osaka
Suminoe Park
Shin Hankai Line
Park
Rinnanji Park
Osaka Line
NO. 1 ST. LINE
Nankai Line
Yamatogawa Park
River Yamato
Nankai Koya Line
Hanna Line
Scale 1/50,000
— KEY —
Proposed Rapid Transit Railway Line.
Subway Line already opened.
G.R. Government Railway Line.
T.O. Electrified Elevated Line
Private Electric Railway Line.
Surface Car Lines on Road in the City are not shown.
Boundary of the City and the Suburbs
Park.



Steel Subway Car, 17 meters long, having two 230 h.p. motors equipped with Dynamic as well as Air Brakes and Automatic Coupler, capacity 120 passengers



Osaka Subway construction under way for double-track Tunnel, showing reinforced steel bars laid in preparation for concrete pouring

Outline of Construction of New Umeda-Shinsaibashi Section of the Subway

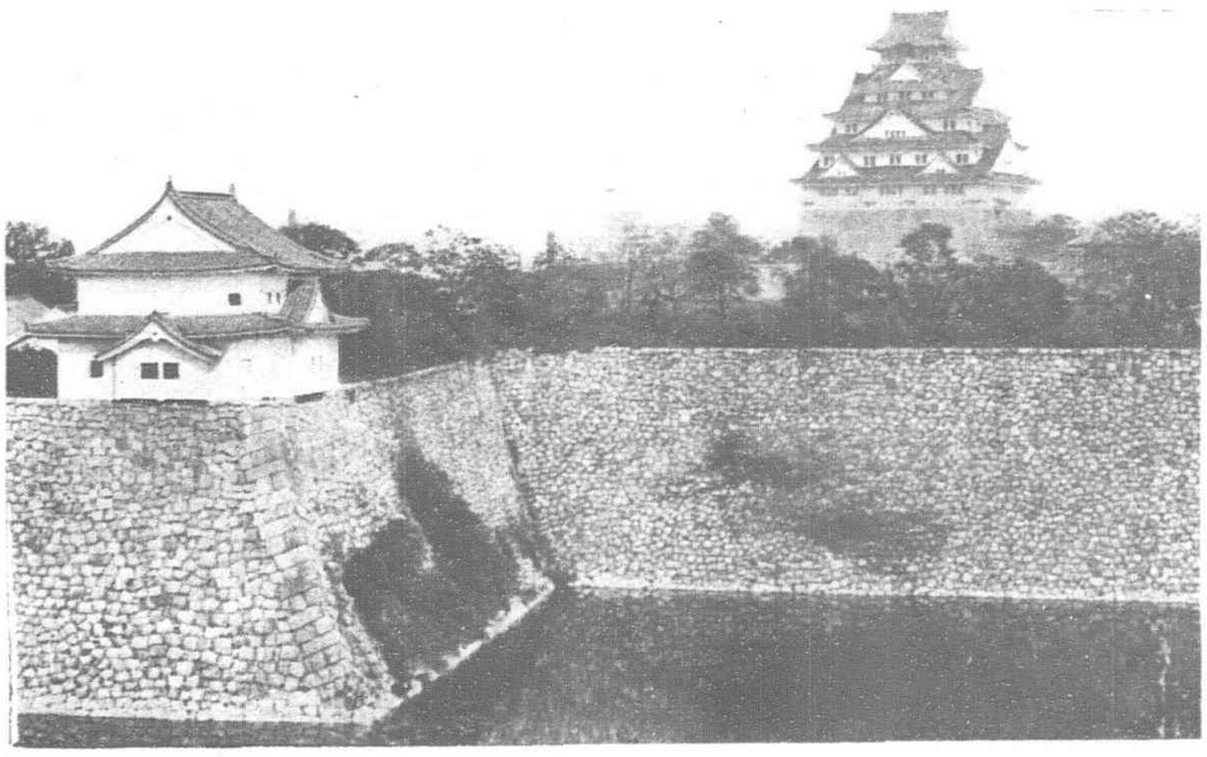
The territory upon which the city of Osaka lies is composed of sand and deposits of fluvial soil. In consequence, difficult engineering tasks. particularly underneath waterways, were necessitated in constructing the first link of Osaka's new municipal subway, which was opened to the public on May 20 last.

Running beneath a 44 meter thoroughfare, recently broadened to this width in carrying out the current city plan, the tunnel structure for the underground line crosses two rivers, the Dojima and the Tosabori branches of the Yodo River, and the Naga Canal. Having been driven directly under these waterways, the depth of the tunnel from the ground surface varies in places from three to 8.5 meters.

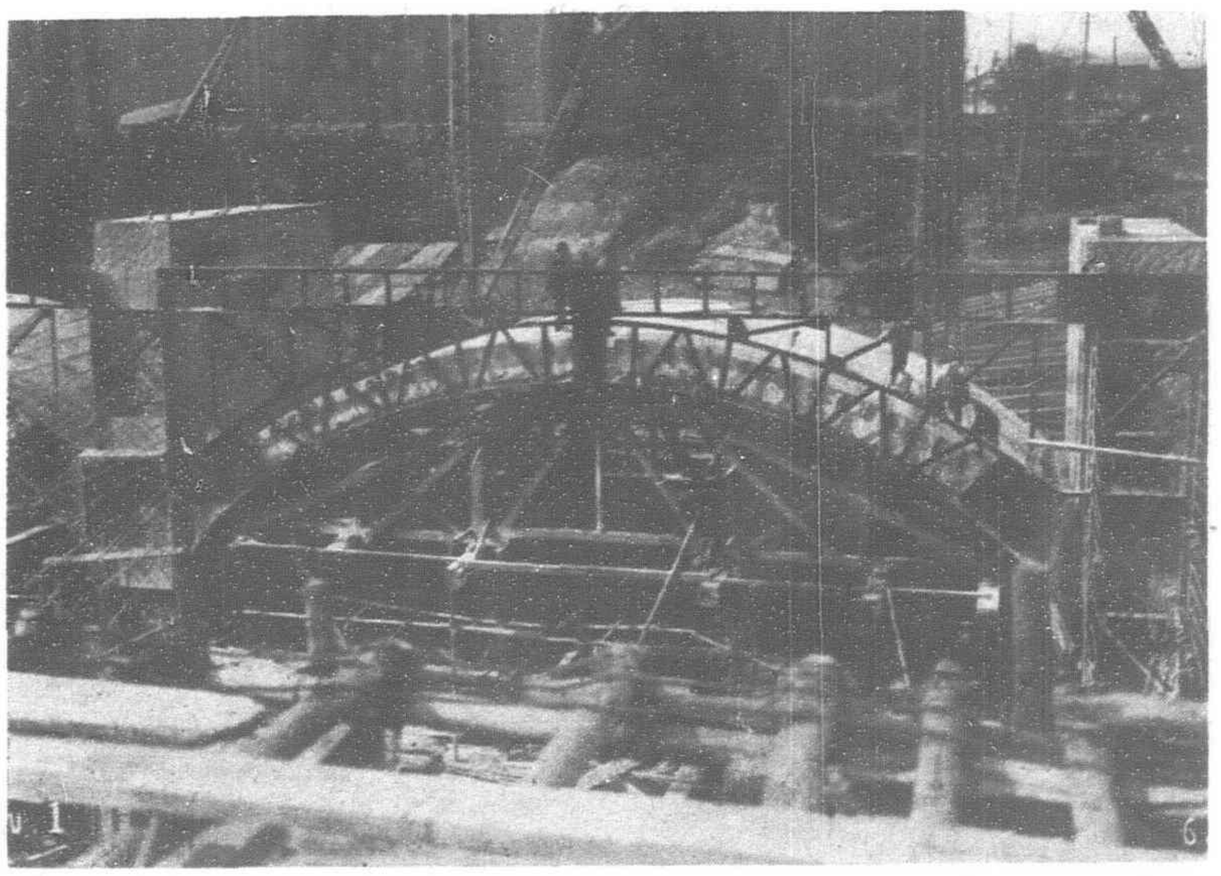
At street crossings the open-cut method has been employed in driving steel sheet piles, subsequently covered with decking. Representing the longest sheet steel driving ever done in Japan, in some places it was found necessary to drive 20 meter piles into the soft sub-soil in order to reach a foundation sufficiently firm.

The tunnel itself is a box-shaped, double-track, ferro-concrete structure having center posts or a septum wall. Its height is about 4.9 meters, and the width for each single-track right-of-way approximately four meters. At canals, the water was temporarily blocked both ways by cofferdams to enable construction by the open-cut method. In driving under two rivers, steel sheet piles were used to shut off and divert one-half of the water course for a distance required by building operations.

As Umeda station is now being constructed below the Osaka Station yards of the Tokaido mainline of the government railways, temporary station accommodations for the subway, having side platforms along the double-track tunnel structure, were in readiness for



The remaining Castle Tower of the Osaka Stronghold built in the Year 1585 still stands as a typical example of Feudal Castle Architecture in Old Japan



Umeda Station while under construction, showing two arches covering station platforms. Upon abutments and pier, bridge piers of Government Electric Elevated will be erected later

Bridge Abutments standing on both sides of Subway Structure under Tusabori Waterway while being constructed. The Caisson Method for Foundation Work was applied

the opening of the underground line last May. Yodoyabashi, Honmachi and Shinsaibashi each have stations equipped with island platforms with the tracks running on both sides.

Brick in mastic or asphalt fabric for waterproofing is laid on the outside of the tunnel structure. With 15 meter, P.S. type rails weighing 100 pounds per yard, the standard gage of 4-ft. $8\frac{1}{2}$-in. ($56\frac{1}{2}$-in.) in track width was adopted. At joints, spot-welding joins four rails together end to end, and these rail sections are fixed to the sleepers by means of screw spikes.

Broken stone ballast reinforces the track bed within the tunnel proper, while concrete imbeds the rails at stations. Long sleepers are laid for rock-ballasted trackage, and these wooden sleepers are all treated with creosote. Short concrete blocks hold rails where the bed is concrete.

Other Details of System

Underground signals consist of three-color lights in conjunction with an automatic train stopper. The operation of inter-locking switches at crossovers is effected by means of an electro-pneumatic mechanism.

To transmit electric power within the tunnel, a third-rail upper contact system is used, with the lines weighing 150 pounds per yard, and carrying 750-volts D.C.

All subway coaches are made of steel and measure 17 meters in length with a weight of 43 tons. They have twin motors of 230 h.p. and are equipped with dynamic as well as air breaks, automatic coupling devices and doors operated pneumatically. Each passenger car is built to accommodate 120 persons with ease.

At and between stations exhaust as well as blow fans, each having a 200,000 cu. meter capacity per hour, are installed in case of necessity.

Ceilings and walls along station passages, mezzanines and platforms are lit by electric lights with especially decorated shading fixtures. At intervals between stations, the tunnel is illuminated by electric lamps, and in the event of temporary current breakage, storage batteries are provided to light stations and tunnel sections.

Electric Substation.—At Umeda a substation takes 22,000-volts a.c. from two different sources, and provides two sets of 2,000 kw. rotary converters, transformers, etc.

Trains run on a regular schedule of every three minutes, and a flat fare of 10 sen is charged. Ever since the subway was opened last May, turnstiles have been in experimental use at some of the stations.

Owing to the fact that the initial underground link was laid in the busy downtown district of Osaka, there is no available site on the ground surface along the route of the subway upon which to locate carsheds. It is interesting to note, for this reason, that necessity compelled the coaches to be lowered onto the subway tracks by derrick suspension from the roadway above, and to make use of a part of the underground station and adjoining space for a repair shop as well as car depot. Later these depots and repair shops will be provided for along elevated lines in the suburbs of the city.

Construction costs of the present completed subway section, including cars, electric substations and other equipment, is approximately Y.11,200,000 or Y.3,700,000 for each kilometer in operation.

The opening this year of Osaka's subway line commemorates the 30th anniversary of the municipal street railway. On May 30, the municipality of Osaka celebrated both of these events—and even a subway march and a sonnet were composed for the occasion.

Principal city officials responsible for construction of the Osaka Rapid Transit Railway are: Dr. H. Seki, Mayor; Y. Hiratsuka, Director of the Electric Bureau; H. Shimidzu, Chief of Department of Transportation; K. Hashimoto, Chief of Construction Division; C. Aoki, Chief of Electric Division, and T. Kikukawa, Chief Engineer of the Municipal Electric Bureau.

New Railway Station for Shanghai

Elaborate plans have been drafted for construction of the new railway station to accommodate the headquarters of the Shanghai-Nanking and Shanghai-Hangchow Railway Administration in place of the North Station which was partially destroyed by Japanese bombardment during the Sino-Japanese hostilities in Shanghai.

Construction on the scale now being mapped out will call for the total of $10,000,000. A vast piece of land situated near the railway station at Chenju has been chosen as site for the new station. This lot of ground is more than 3,000 feet long from south to north and more than 10,000 feet long from the intersecting point of the Shanghai-Nanking and Shanghai-Hangchow lines on the east to the Chenju Station on the west.

When construction work starts, it may be necessary to make arrangements for the removal of grass huts and other cottages found within the area. Negotiations are now proceeding for the purchase of all the lands within the mapped-out area from the villagers by the railways administration.

During the first stage of work, the main building to accommodate all the departments of the Railway Administration, the station platform and other offices will be built. Construction to increase the railway tracks, to build a small railway workshop and to enlarge the godown at Markham Road will be carried out. The funds required for the completion of all this preliminary construction are estimated to be around $7,000,000.

Plans have also been made for the removal of the central railway factory where all important repairs to locomotives and construction of engine parts are made from Wentsaopang to the new central railway station at Chenju. The construction of this factory will be proceeded with slowly and in so far as the business income of the railways affords.

A large part of the funds required for the preliminary construction for the new central railway station, according to a responsible official of the Shanghai-Nanking and Shanghai-Hangchow Railway Administration, is now already available. To fill the gap, he said, it may be necessary for the administration to secure a loan from foreign sources.

Construction Activities in Singapore

By Assistant U.S. Trade Commissioner DONALD W. SMITH

Although Singapore, in common with other important world cities, is suffering from the throes of the present economic depression, a number of important government and private building projects are under way. American firms, however, are barred almost automatically from bidding on materials or equipment for any government construction work, as a result of the policy of the Straits Settlements Government of buying only British products.

The 1932 budgets of the Straits Settlements Government provide a sum of S$8,099,340 for government construction work in Singapore during the year. Of this amount, S$800,000 is being expended on a new prison, which is expected to cost S$2,050,000 before completion; S$300,000 on the S$2,200,000 Teluk Ayer Basin project, which calls for the dredging and construction of quay walls along the sea front; and S$200,000 on the reclamation scheme to reclaim land between the Singapore and Rochore Rivers.

Another important government undertaking that is nearing completion is the new Johnston's Pier, which is being built in the busiest section of Singapore's water front at a cost of S$468,000.

Other government projects recently completed or nearing completion involve an expenditure of S$2,523,000 and include the following: Buildings for Monopolies department, S$300,000; detective station and quarters, S$500,000; barracks for Sikh policemen, S$630,000; police barracks, S$458,000; reconstruction of the central police station, S$215,000; and a new government printing office, S$420,000. During the first quarter of 1932, the Straits Settlements awarded contracts amounting to S$98,080 to private firms in Singapore for minor projects.

Private building and construction work has fallen off considerably in Singapore during the past few years, but at the present time several important projects are under way involving a total of S$2,570,000; the largest of these is the new grandstand, race-course and stables being built for the Singapore Turf Club at a cost of approximately S$1,750,000. Two modern breweries have been erected at a total cost of S$470,000.

Construction of the Jelubu Dredge

Engineer Describes Work of Fabrication on Site from New and Second-Hand Parts

(The following paper by Mr. E. F. Harris who supervised the erection of the dredge was given recently before the Dredging Association of Southern Malaya, as Published in "The Malayan Tin and Rubber Journal.")

By E. F. HARRIS

JELUBU Tin Dredging, Ltd., was floated in October, 1929, and is a dollar share issue. Due to the rapid fall in the tin price and the slump generally the amount subscribed was not to expectations. This meant a readjustment of the original program which was to put a new British built dredge on the property. Tenders had been called from four British firms for a dredge of 80,000 cub. yards capacity, but the prices were all too high in view of the reduced capital available. It was finally decided to purchase a pontoon that was on offer locally and the machinery from another dredge that had been converted into an electric plant.

On inspection, these different units were found to be in first class condition. The pontoon still had most of the original erection marks showing and the machinery was nearly new. A general plan and specification was got out by Mr. W. G. Watson of Malim Nawar and flotation and sizes of the two units were found suitable.

It was decided to build the dredge at the mine owing to two factors, one being the matter of costs and the other the difficulty of correlating the various units if built overseas.

The site of building was 28 miles from Seremban railway station and is reached by a narrow mountain road over a pass 2,300 feet high with a rising grade of four miles on the Seremban side and 3½ miles descent on the other. Some of the units to be transported were very heavy, the bottom tumbler of 11¼ tons was the heaviest and the largest, a pair of 11-ft. 6-in. gear wheels.

The cost of the whole of the dredge transport from railhead to Mine worked out at $3.85 per ton or .14 per ton per mile including loading and unloading.

Workshop and Equipment

The workshop was laid out so that it could all be used as erecting shop and part of it could subsequently be turned into a tin dressing shed. It is built of steel framing with wooden rafters and is 122-ft. × 35-ft. The machinery installed consisted of a punching and shearing machine, shearing up to ¾-in. and punching 1-in. plate and it takes angles up to 6-in. × 6-in. × ⅝-in. A crab which was rigged for pulling long plates through the shears and a crane and tables for feeding plates to the punch.

The machine cost $2,630 erected and was purchased direct from Hamburg. It has given no trouble and the original tools are all in use and have not even required sharpening. This remark does not apply to the punches.

A 6-ft. 6-in. redial drill bought second hand from England cost $655 under an inspection guarantee and was found equal to new. Two lathes were used, one 14 inch gap and 16-ft. bed and the other six inch gap and six foot bed was hired for six months. A power hack saw and double emery wheel and two forges with air from power blowers and a hand screwing machine completed the outfit.

The shop was driven by a 5 h.p. Petter which supplied ample power and gave no trouble and is exceedingly cheap to operate costing-/07 per hour. A small brass foundry was in use towards the end of the job. In all we made 1,125 lbs., of finished brasses, costing-/33 per lb.

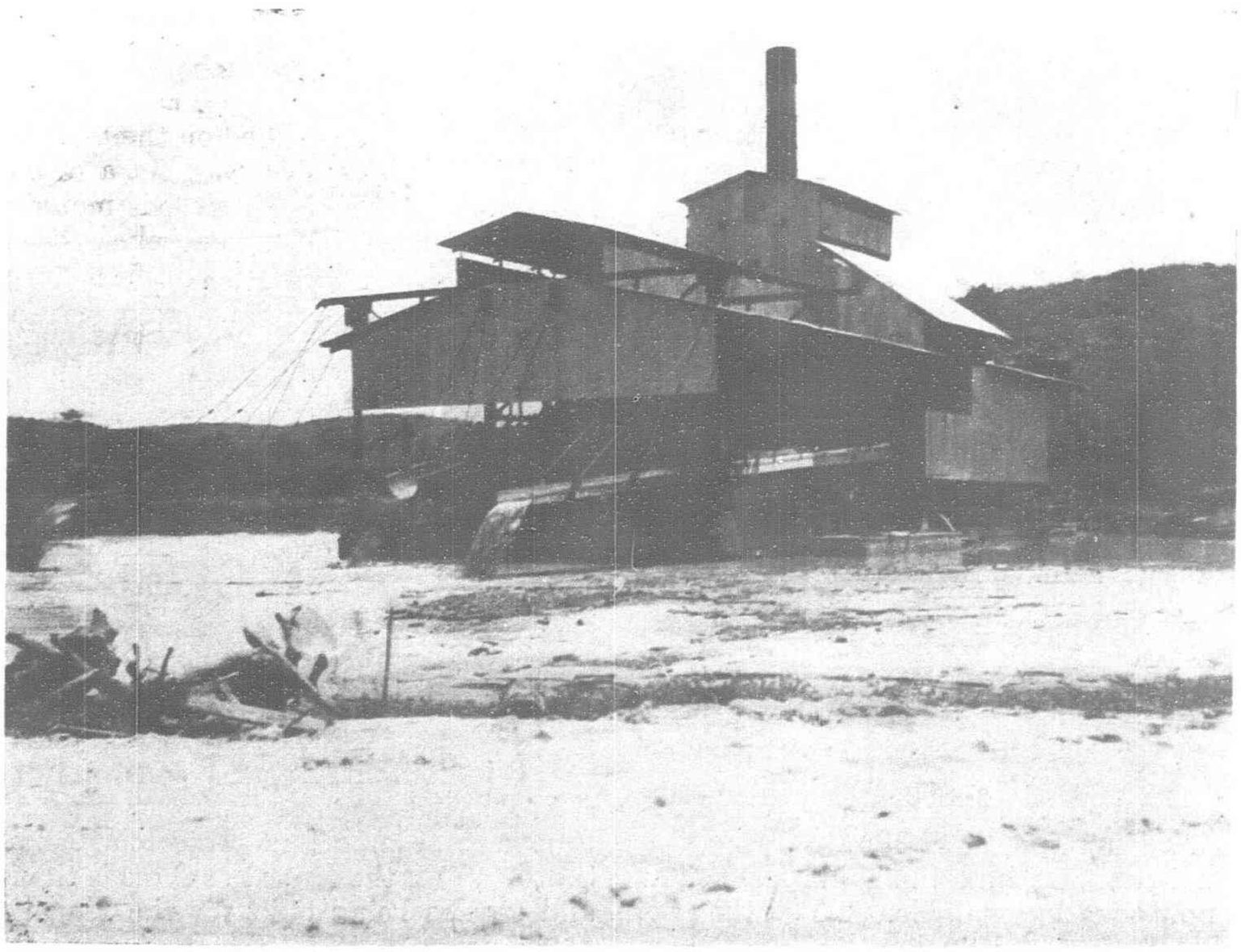
Pontoon

The pontoon is 128-ft. 8-in. long by 44-ft. 5-in wide and 8-ft. 4-in. deep amidships with a camber tapering to 8-ft. 0-in. on the side. It was erected in the dock as water was not troublesome. New stern plates were fitted and a wearing patch four feet wide right across the stern.

The well was shortened by the addition of an extra compartment 10 feet long which brought the main bulkhead in the well 10-ft. forward. As the pontoon had been in use with boilers fired with bakau firewood, 224 sq. ft., of deck plates ¼ inch thick and the deck girders beneath them were badly pitted. These were renewed at a cost of-/07 per lb.

Total cost of erection on pontoon up to the floating was $24,655. This included painting and new chaffing beams to suit the new ladder.

Two pump screens were fitted, port and starboard for the two pumps. These are 16-ft. 0-in. × 3-ft. 6-ins. × 5-ft. 6-ins. deep, and also have two boxes 12-ft. long 12-ins. wide and tapering from 10-in. to 18-in. with sides and bottom perforated to draw off the clean water on the top of the paddock. These are fitted so that the top of the box is about 1-in. clear of the water and with one on each side of the screen the bottom half of the screen box can be cut off and although the pumps are drawing from 5-ft. below paddock level they are only getting the top paddock water.



Showing the Dredge at Work

Machinery Installed

The machinery bought locally and installed was as follows.—

A Babcock and Wilcox boiler of 2,530 sq. ft., heating surface, with superheater of 434 sq. ft. This was originally fitted with a chain grate stoker for coal and was converted for burning jungle firewood. The pressure is 160 lbs. per sq. inch. Part of the framework of this boiler was missing and a lot bent and twisted, as it came from a capsized dredge. The casting for the front end was supplied by the makers and all the wrought-iron done on the mine. Thirty new tubes were fitted.

The dredging engine is a Marshall horizontal cross compound, developing 120 h.p. at 125 revs. This engine also drives the screen. The high pressure pumping set is a Bellis Morcom vertical high-speed, totally enclosed type, developing 150 b.h.p. direct coupled to an Allen 2 stage pump 12 inches delivery, 2,500 gallons per minute with a head of 120-ft. This water goes through the condenser.

The low pressure pump is a 10 inch delivery by Hathorn Davey and is driven by an Allen engine, high speed, of 80 b.h.p. This engine also drives the jigs. This pump delivers 2,000 gallons per minute at a 40 feet head at 750 revs. per minute.

Winches are by United Engineers, Ltd., mooring winch of the eight drum type and ladder winch a separate unit but all on the same base of girder type foundation.

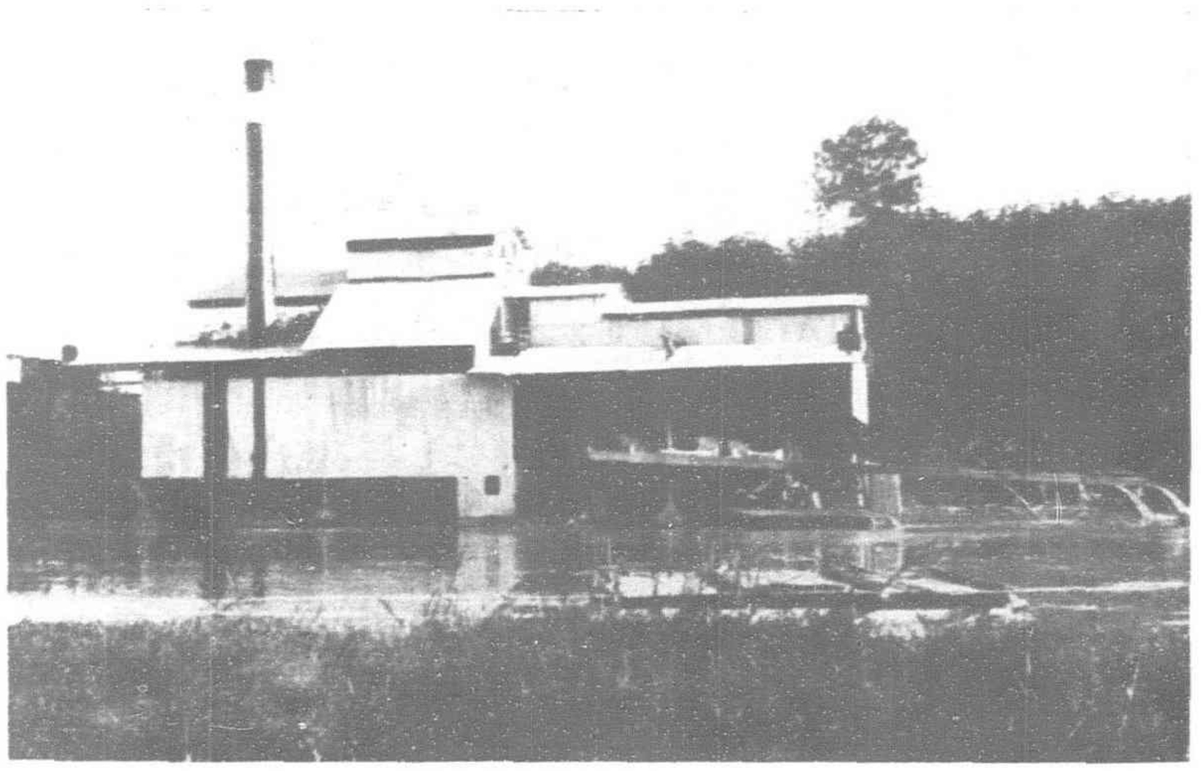
The boiler feed pumps, are two separate units Weir standard vertical type capable of handling 960 gallons per hour.

The condenser is vertical type surface, condensing with a cooling surface of 750 sq. feet. The heater is a vertical cylindrical tubular type 3-ft. 6-ins. × 7-ft. 9-ins. between plates.

There is a Bellis and Morcom vertical tandem compound lighting set, 110-volts.

Bilge Pump. Worthington horizontal duplex 6-ins. × 4-ins. × 6-ins. to handle 1,850 gallons per hour. A Frenier sand pump was installed to handle the concentrates to the clean-up jig, size 48-ins. × 10-ins. This is set into a well in the deck so that the shaft is 6-ins. above deck level. This saves about two feet of height in the whole feed distribution from the screen.

A Titan separator size T 65 to handle 1,000 gallons per hour was put in to take the discharge water from condenser. It delivers to the Hotwell and has done extremely good work and given no trouble. It cost $730 on the mine and the feed water goes to the pumps as clear as if filtered.



Another view of the Dredge

Ladder and Tumblers

The bucket ladder was purchased complete with top and bottom casting, rollers and hanger gear. It was built of ½-in. side plates Tray liners 5/16-in. top and bottom ties ⅝-in., bulkheads ½-in., top and bottom angles 6-in. × 6-in. × ⅝-in. Bulkhead angles 4-in. × 4-in. × ½-in. 24 feet were cut of the ladder and two feet off depth, bringing it to 78 feet between centers and 5 feet 6-in. deep. This was done on the mine. The material cut out was used in the superstructure, mostly in the main framing. The ladder rollers and chairs needed no alteration. They are of the renewable shell grit proof type with grease lubrication and are of 18-in. diameter.

The hanger gear was all altered on the mine, to suit the ladder and new cantilever fore gantry. It now has six sheaves 36-in. dia. New shafts were made on the mine from old propeller shafts bought in Singapore. The shafts are, top 9½-in. dia., and the bottom sheaves run on a 7-in. shaft. The shaft carrying the hanger bars is 12-in. dia. Hanger bars are 8-in. × 3-in.

The bottom tumbler is of solid cast steel 3-in. thick on the tread and weighs 11¼ tons. It is 4-ft. 10-in. in diameter on the tread and works in grease lubricated bearings and is grit proof. The bottom of the ladder carrying these bearings is very stiff and after 10 months working there is no appreciable wear on either bearings or tumbler shaft, due I think to the fact that owing to the rigid construction the packing can be kept tight and thus prevent any grit entering.

The bearings are 14-ins. dia., and 18½-ins. wide and the tumbler does about two revs. per minute. It is of course extremely big and heavy for a dredge of this type but is certainly very successful, which is after all the essential consideration. This tumbler was purchased locally with the ladder.

The top tumbler is a solid cast steel six sided type, made of annealed carbon steel 35.40 ton tensile strength. Tread plates and side plates are of manganese steel. The shaft is 14½-ins. dia., and the bearing 25-ins. wide. This is a new tumbler designed to fit the buckets and crown wheel, both of which were purchased locally but from different units.

The buckets are of 7 cu. ft., close connected and are of manganese steel of the "two-eye, one eye type" and 4½-ins. pins L headed.

The problem was to correlate these various units and build a suitable superstructure and treatment unit to make the whole into an economical dredge. It very soon became clear that even if the various units were made overseas, the fitting together was going to be a big and costly job and the time lost on submitting and altering plans and designs would be enormous.

The whole job was therefore done on the mine. The new top tumbler was made by Hadfields. Screen rollers and paths of cast steel were made by the Skoda Works, Austria. Most of the plates, channels and joists are Continental. Cast iron was made by Thong Lee in Kuala Lumpur and machined on the mine. The jig shafts and bearing came from Sweden.

All the superstructure material was imported in standard lengths and sizes. Some continental firms I understand are prepared to cut r.s. joists, etc., to exact length for quite small orders. This had it been known at the time would have reduced the cost still lower but on the other hand it is extraordinary how cuttings can be worked up on a job of this sort. Short pieces of angles and pieces of plates can be used for gussets, etc., channels and joists for foundations under small pumps, etc. There is very little waste.

The General Outline

Detail plans were all made on the mine also all the blue prints that were used.

The general outline of the superstructure consists of four continuous lines of framing, two on the well sides and two on the outer edge on the pontoon with the usual athwartship frames.

The two well side frames are tied from bow to stern with double chords of ½-in. plates 18-ins. deep and braced by 3½-ins. × 3½-ins. × ½-in. angles. At the bow gantry this chord is 5-ft. in depth and also 5-ft. deep. At the main framing under the top tumbler gear between these two frames it is 2-ft. 6-ins. The outer chords are 12-ins. × 3½-ins. × ½-in. channel, running the full length of the dredge. All columns are 8-ins. × 6-ins. r.s. joists, also all rakers.

A 15 ton crane is fixed on the bow gantry to handle the bottom tumbler. This is operated from a drum on the main winch.

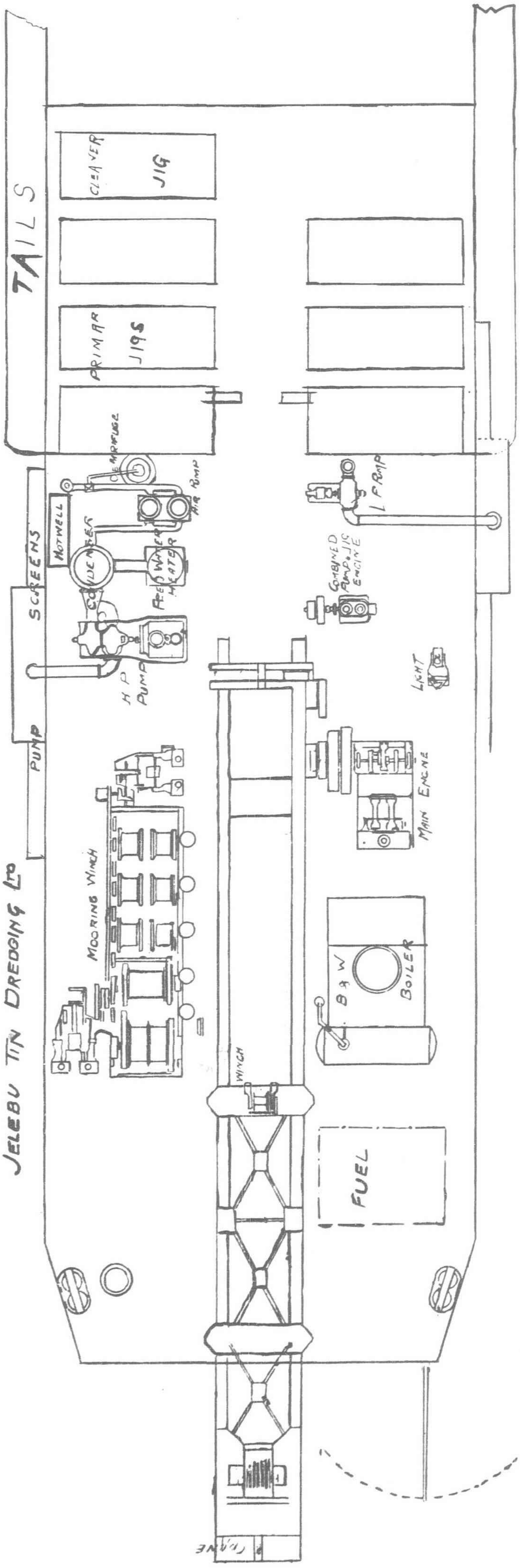
A small cargo type winch is mounted on the two top chords, so that it clears the buckets when they are at the highest point, or when the tumbler is hoisted 5-ft. 6-ins. above deck level. This winch operates the bow crane on the port side and is also used to handle buckets and can be used on the 15 ton crane.

All framing and columns are fixed to the deck by heavy deep gussets and continuous 12-ins. × 3½-ins. × ½-in. channels running fore and aft and bolted to the deck to form sole-plates. These are filled with concrete to the top of the channel. The depression frame, main frame, mid frame, stern frame and all athwartship frames are of 8-ins. r.s. joists and all columns, rakers and cross members and are bracketed with ½-in. plate.

The Screen

The screen is carried on heavy plate girders which are an extension of the above framing which is braced when the screen and chutes go through with ½-in. plate girders 4-ft. 6-ins. deep.

The drop chute is of the fixed type. The ladder is flat at our normal dredging depth and as the chute is well below the ladder and discharge point it has been carried well forward and is fitted with side trays that carry a lot of material back. The usual grizzley and save-all is fitted. The save-all is washed down and the concentrates fed to the Frenier pump every morning.



It is the writer's opinion that the main loss in dredging occurs in the screen. During this last 12 years dredging as a whole has advanced wonderfully in all respects except the screen. On this dredge I have aimed at a machine that will screen a large quantity and if it is wanted can be used in the nature of an open-ended tube mill to break up the material.

The screen is heavy and very strongly braced. It runs on heavy steel rollers 39-ins. × 13-ins. face all flanged—all both top and bottom being the same. One top roller is geared and drives the screen.

The screen is carried on two roller paths 8-ft. $6\frac{3}{4}$-ins. dia., 12-ins. face on tread with a flange width of 15-ins. and held to the shell by $\frac{7}{8}$-in. bolts at 33 mm. centers or 122 to each roller. These roller-paths and rollers were made by Messrs. Skoda, Austria, and so far have given every satisfaction both in material and finish.

The screen is 6-ft. $3\frac{1}{4}$-ins. dia., inside and is 34-ft., overall with a dead plate of 6-ft. 0-in. on the top and 5-ft. 0-in. on the bottom, giving 23-ft. 0-in. of perforations. It is of the single plate type. Top and bottom shells are of $\frac{1}{2}$-in. plate—joints oxy. welded after the plates had been tightly bolted to the paths. The perforated plates are of $\frac{1}{2}$-in. mild steel. Holes are $\frac{3}{8}$-in. and spaced at $1\frac{1}{2}$ins. centers.

A 30-ins. × $\frac{1}{2}$-in. reinforcing plate is rivetted to the outer shell between the shell and the path flange. The bolts therefore have 1-in. of metal to pull on and this enables a heavy and deep countersunk to be used and stops that terrible nuisance of bolts working loose and pulling through which often occurs. The end plates are held in position by 6-ins. longitudinal members, each of double 7-ins. × 3-ins. channels rivetted back to back. These are carried well along the dead plates and are fixed with very heavy lug plates. The circumferential bands are 1-in. thick by 10-ins. wide built of $\frac{1}{2}$-in. plate, breaking joint and oxy-welded. These carry the screen plates.

The longitudinal members are again held by 8-ins. × $\frac{1}{2}$-in. straps on their outer edges with heavy strap plates.

Breaking Material up

No sparge pipe is used. Two high pressure jets are placed on the top end and play one on the dead plate and on a little lower down and three fixed jets and two $1\frac{1}{2}$-ins. monitors on the bottom end. These are all fixed to play from different angles at different points on the material as it traverses the screen.

As there is nothing in the screen to break such as a sparge pipe, the material can be broken up by means of old bucket links, spikes, or pieces of old angle iron, etc., bolted in the screen. We find old links, spikes, or pieces of old angle iron, which are rivetted to angle iron to bolt to the screen and placed with the link facing the wear, are very good. The material carried up and the jets get a good punch as it falls and the material washed into a good condition for jigging.

It must be remembered that although material goes through the screen, if it is clayey and puggy it still will carry off big values, as the jig will not disintegrate these small lumps to any extent. The smashing with the jets and baffles in this screen certainly helps to clean the material and I would not go back to the sparge pipe again.

The collecting box under the screen is built so that the material from the lower half of the screen meets the portion from the upper half and causes a boil and therefore a mixing of the material about halfway down the length of the screen. At this point the bottom of the box is in the shape of a deep launder 2-ft. deep. Just below the boil this launder is divided into six compartments which is one for each primary jig.

This method is positive and has been found very effective. It is quite simple as each jig gets its one-sixth of the material screened. It was thought at first that it would be necessary to put plates in the launder to secure an even flow right across the width of the six compartments, but this has not been found to be needed in practice.

The Jigs

Jigs are seven in number, six primary and one cleaner jig. They are all 6-ft. 6-ins. wide four hutch type 16-ft. 0-in. long and arranged three on each side athwartships. They are built of 5/16-in. plate, 3-ins. × 3-ins. × $\frac{1}{2}$-in. angles and well braced both across and lengthways. They are carried on 7-ins. × $3\frac{1}{2}$-ins. channels which in

turn are supported on the superstructure. The shafts are 3½-ins. dia., and run in five ring oil bearings. The eccentrics are iron cast iron with white metal linings in the straps. Jig beds are of the continuous fall type, the fall being 12-ins. in 16-ft.

The shafts were imported, also the ring oil bearings. All the castings were made in Malaya and machined on the mine, and the jigs were all built on the mine. The cost of each jig erected worked out at $950.

As noted above these jigs are of the continuous fall type and while they give no trouble, still I think the older type has advantages. It is easier to control, finer work can be done and it is not so liable to boil or loose ragging. It is claimed that the step type has a greater capacity. I think that is debatable. Primary jigs run at 140 and the cleaner jig at 180 r.p.m.

Frenier Pump

The concentrates are fed to the cleaner jig by a Frenier pump. This runs at 40 rev. instead of the maker's recommendation of 24 and has a much greater capacity and stands up quite well to its work.

The jig drive is so arranged that the cleaner jig and Frenier pump are driven through a primary shaft countershaft from the jig engine. On the end of this shaft a clutch is fitted which engages a pulley driving through a second countershaft and to the primary jigs. The throwing out of the clutches stops the primary jigs and allows the load to be cleaned up in the jig concentrates launders and in the clean-up jig itself. In starting the reverse happens. The Frenier and the clean-up jig start up and when they are properly functioning, the primary jigs are put in through the cluth. As the low pressure pump is on the same engine as the jigs, no loss occurs through concentrates being washed down the launders before the jigs get going properly.

Total Saving

Work started in May, 1930, and the dredge was working in September, 1931, a total of 16 months.

The total cost was $232,500 up to the time of starting.

An estimated saving of $160,000 was made on the job. It was nearly all done by day labour, some small contracts being let. Only Asiatic workmen were employed. No hitch occurred with labour and delivery of materials was excellent, although parts were picked up all over Europe.

Of course times were favorable for such a job as labor was plentiful owing to the slump time having begun to be felt and material was cheap. From my experience of this dredge, I consider it would pay any mine with a good workshop to build their own dredges.

Some Further Notes

Further to my notes in my original paper of August 1932 on the jigs at Jelubu and the matter of Sloped versus Flat stepped beds, I can now put forward some figures which are the result of tests, and the alterations arising therefrom, on the dredge.

The following figures were obtained by weir measurements of the quantities of water used on the jigs.

1,796 gallons per minute of water at a pressure of 40 lbs. per sq. inch was used in the screen, this is all used through monitors, and as there is no dewatering it all goes to the six primary jigs with the feed, there is a very small amount that passes over the bottom dead plate which may be left out of our calculations.

The hydraulic water used amount to 2,376 gallons per minute, and is evenly distributed over seven jigs.

Each jig therefore uses approximately 640 gallons per minute. This works out at five tons of water per ton of material treated—for the purpose of arriving at tonnage I have taken one cubic yard in situ to equal 1½ tons. This figure can be adjusted to suit the class of ground being treated.

The water used in the saveall measures 450 gallons per minute, it would be interesting to have figures for pahlong dredges, for comparative purposes.

Jig Plungers

The jig plungers are fitted with clack valves (one is in the fitting shop for inspection). The plunger is 36 inch by 48 inch and the 14 clacks are each four inches square or a total of 224 sq. inches. These valves allow a certain amount of water to slip on the suction stroke, and the result is that the normal pulsion stroke is followed by a much lighter than usual suction and we find it keeps the jig bed more lively and does not drag down so much sand.

Samples were taken over a period of seven months with the solid plunger and the ones described above which we are now using, and these samples show that the present feed is about 75% of the feed that had to be put through the cleaner jig when using the sloping beds and solid plungers. Of course the stroke has to be adjusted to suit the altered conditions.

We find the cleaner jig much easier to handle as the extra 25% of feed referred to mostly came in rushes through the primary jigs scouring or boiling. As the feed is now much more regular there is no need for the constant alteration to speed etc., to deal with these rushes.

The jigs were originally all sloping beds but as we found them hard to control and slow to clean, and had great trouble in keeping enough fine ragging in the beds, they were all gradually altered. They are certainly much easier to control now.

Some yardage figures are given below, at times as the feed is fine and sandy the six primary jigs have to deal with the whole of the material that is being dug and there is no trouble in overload and we have never had to slow buckets to ease the jigs.

Concentrates Pump

The pump on the after deck is a locally built one and we now use these and find them quite satisfactory, it may be noted that the pump is geared to a speed that takes up all the feed without overflow, the gears are also local.

Some recent costs and yardages may be of interest. The month of September, is a part month only.

Month	*Yardage*	*Mine Cost*
September, 1932	73,000	8.78 cents
October	105,000	6.55 ,,
November	98,500	6.50 ,,
January, 1933	101,000	6.48 ,,
February	91,000	6.90 ,,
March	105,000	6.78 ,,
April	98,000	7.36 ,,

September is a part month run due to stoppages under restriction.

Stalinsk Produces First Steel

On September 19, the Stalinsk (Kuznetz) steel mill produced the first steel ingots from its first 150 ton open-hearth furnace, the largest in the Soviet Union. A chemical analysis showed this steel to be of exceptionally high quality, with an insignificant content of harmful ingredients (0.008 per cent sulphur, 0.017 phosphorus). Three other furnaces are already completed and will gradually be put in operation. The fifth and sixth furnaces are being installed. The open-hearth department when completed will consist of 15 furnaces, each of 150 tons, and will not only rank first in Europe as regards output of steel but also with respect to the quality of its equipment and the degree of mechanization. The annual capacity of the department will be 1,450,000 tons of steel ingots.

By the end of September, *i.e.*, during twelve days, the first furnace produced 1,235 tons of steel, daily output reaching 175 tons on September 30. The daily output in October was scheduled to average 233 tons. By the first of October the rolled steel department was nearly ready to start operations, and it was expected that some time this month the Stalinsk plant would produce its first rolled shapes and by November 7 its first rails.

The blast furnace department of the Stalinsk plant produced during September 38,620 tons of pig-iron, or 93.2 per cent of the program. This was a marked improvement over August, when the program was fulfilled only 70.2 per cent. This progress was achieved despite the fact that considerable difficulty was experienced in securing the necessary ore from Magnitogorsk. Blast furnace No. 1 slightly exceeded its program (100.2 per cent), pouring 20,729 tons of pig-iron during September. Furnace No. 2 fulfilled its program 86.5 per cent, with a total of 17,891 tons.

On September 21, the fourth and last turbo-generator (24,000 kilowatt capacity) of the first section of the Stalinsk power station was put in operation. The total capacity of the section is 60,000 kw.—two turbines of 6,000 kw. capacity each and two of 24,000 kw.

Japan's Rayon Industry

By EISABURO KUSANO

THE Japanese rayon manufactures have created a sensation in the world commerce. Tariff walls are already built against them in Canada, Egypt, South Africa, Australia, Malay States, and the Philippines to say nothing of British India. And, indications are that the trade barrier would be made still higher.

Japan ranked at the ninth in the world list of rayon producing countries in 1927. In the 1932 ranking, however, Japan was next only to the United States, Italy and Britain. Furthermore, the difference between the 1932 total output in Japan and that of Italy and Britain was so narrow as to be about one month's production.

These two distinguishing facts give a sufficient indication as to the international importance of Japan's rayon industry. Impressive though these achievements are, the industry is still young in Japan. It was in the course of the past half decade that the enterprise grew from its infancy to the present day stage. The progress was meteoric and it has revolutionized the fibre industry in the Island Empire.

The rayon yarn output, which rose from 100,000 lbs. of 1918 to 64,000,000 lbs. of 1932, alone has come to add Y.100,000,000 a year to national industrial production and it gives 30,000 factory workers employment. The 1932 rayon fabric export amounted to Y.60,000,000.

Side by side with this quantitative advance, the Japanese rayon industry has also shown remarkable progress in its technical aspects as well. A convincing proof of this is that the recent voluminous surge in output resulted almost entirely from increases in the production of finer grades of manufactures.

That the Japanese have had experiences in silk reeling and weaving for generations past is evidently a great advantage, and that Japan is almost self-contained in the raw material supply is another strong point of this rising industry. These factors promise a greater future, and, in point of fact, expansion programs are well under way at present. But there are, at the same time, a number of obstacles that have to be surmounted.

The present article now proposes to study the development in the past as well as outstanding problems.

Outline of Development

(*a*) *Pioneer Attempts* :—It was about 20 years ago that the first systematic research work on rayon was conducted in Japan. Dr. Hirotaro Nishida, professor of the Kiryu Higher Technical School, Gumma Prefecture, who, in those days, was the chief engineer of the Japan Celluloid and Rayon Co., Ltd., of Aboshi, Hyogo Prefecture, carried out various experiments at the company's laboratory.

The Japan Celluloid and Rayon Co. was promoted in 1908 under the joint investments of the Mitsubishi, Iwai and Suzuki Houses, and it started the celluloid production in 1911. Its original program was to manufacture rayon side by side with celluloid, but the company was unable to do so as Dr. Nishida's experiments and studies were not sufficient to transfer the enterprise from his laboratory to the factory.

But Mr. Naokichi Kaneko, of the Suzuki concern, one of the joint promoters of the company, was interested in Dr. Nishida's experiments so much that he established the Azuma Industrial Co., Ltd. at Yonezawa, Yamagata prefecture, in 1913, to produce rayon for the first time in Japan.

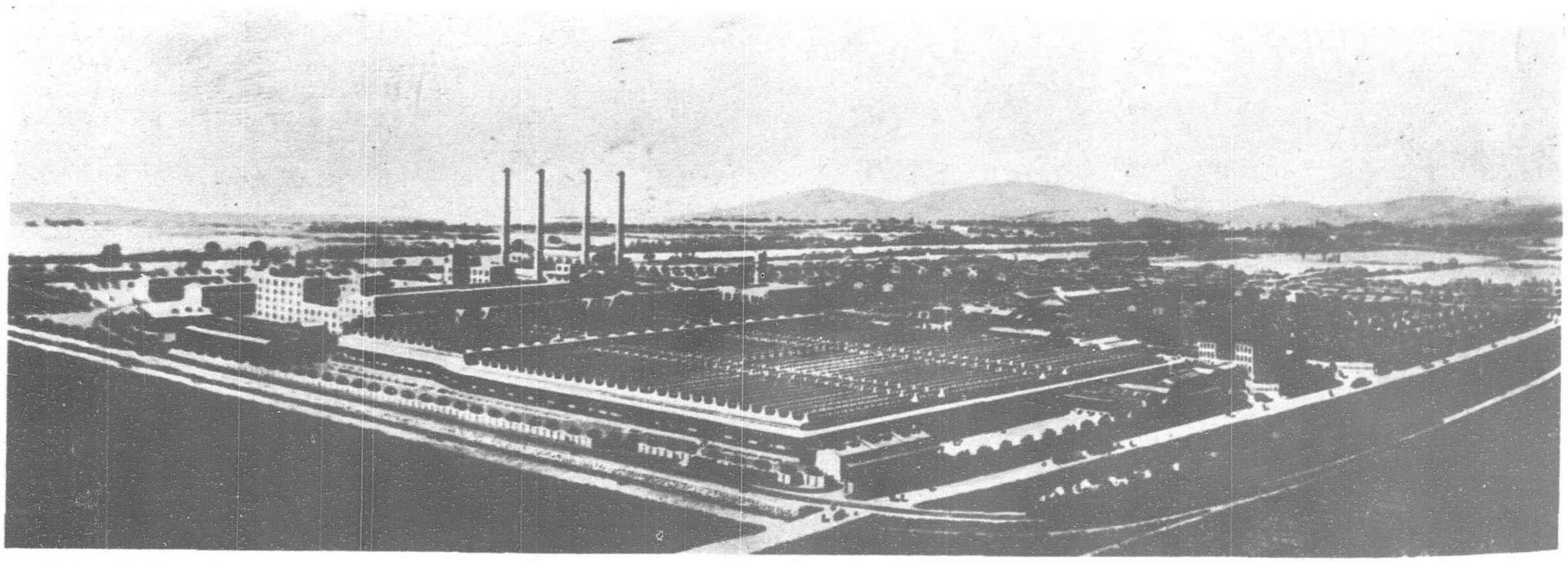
It is known that the first rayon manufactures in Japan thus turned out by the Azuma Industrial Company were poor in quality and high in price as production technique was still in the elementary stage of progress and also as the cost could not be reduced because of large initial outlay for the machinery equipment. The Azuma Company's enterprise, as the result, was anything but a financial success.

Admitting that the first attempt in producing rayon in Japan thus did not fare well, one cannot overlook the fact that it attracted much attention from the public as well as from other industrial promoters of Japan. In point of fact, several other rayon companies were established in rapid succession in and between 1916 and 1918. The rayon enterprise of the Azuma Company, too, was then reorganized in 1918 into an independent joint stock company, capitalized at Y.1,000,000, and called the Teikoku Jinzo Kenshi Kaisha, Ltd., familiarly known as "Teijin," which is to-day one of the most influential rayon producers in Japan.

With the solitary exception of the "Teijin," however, none of these pioneer rayon companies proved profit-yielding because of their technical incapacity, mechanical imperfections, and high cost of production. Moreover, they all suffered from financial difficulties, and amalgamations and liquidations eventually began.

Then there occurred the devastating earthquake in September, 1923, over an extensive area with Tokyo as its calamity center. It necessitated further readjustment of the then existing rayon enterprises which were already in difficulties. Notable among these changes which took place just before and after the earthquake are the followings:

The Asahi Kenshoku Kabushiki Kaisha was established in May, 1922, as the result of the purchase by this new company of



General view of the Iwakuni Factory of the Teikoku Jinzo Kenshi Kabushiki Kaisha, familiarly known as the Teijin. This is one of the best equipped Rayon Factories in Japan

the Asahi Jinken and the Fuji Jinken, two independent concerns.

The Oka Partnership, of Tsu, Mie Prefecture, purchased the Nihon Jinzo Kenshi K.K. and the Toyo Jinken K.K., and established the Mie Artificial Silk Co., Ltd.

(*b*) *Post-Earthquake Development* :—The earthquake of 1923 marked the inauguration of a new phase of development in Japan's rayon industry.

Experiments in the pioneer days established the position of rayon as an intermediary substance between silk and cotton, while the industrial readjustments caused minor enterprises to be either absorbed by or amalgamated with more powerful companies, and the industry, for the first time, was put on the profit-yielding basis due to the rise of a brisk consuming demand.

Growth of Industry

To explain the situation more in detail: Rayon primarily received serious attention in Europe and America, where raw silk is not produced, as substitute of this natural product. And, it has created a new field of its own by becoming an intermediary substance between silk and cotton. Through its mixed weaving with raw silk and cotton yarn, moreover, rayon has not only increased the demand for itself but also it has given new life to the silk and cotton industries. Its importance was then further enhanced on account of a number of its peculiar characteristic qualities—such as that the production is not restricted by climatic or any other natural factors, as in the case of raw silk, that it can be produced on a large factory basis, and that the cost of production is exceedingly small.

In addition to these commendable qualities, the rayon industry in Japan has a unique advantage, viz., the experience in silk weaving. The silk industry in Japan is more than 1,000 years old, and there is no denying that the centuries-old knowledge and experience in this industry has contributed a great deal to the abrupt development that the rayon enterprise has made.

Another factor that brought forth the abrupt expansion of Japan's rayon industry was that the enterprise began yielding enormous profits when all other manufacturing industries were suffering from acute depression.

While the rayon manufacturers were grappling with their technical and financial difficulties in the earlier stages of development, the consuming demand went on increasing. In 1918, the rayon yarn output in Japan amounted to 100,000 lbs., and it increased to 780,000 lbs. in 1923, while the import, too, rose from 77,000 lbs. to 952,000 lbs. during the same period.

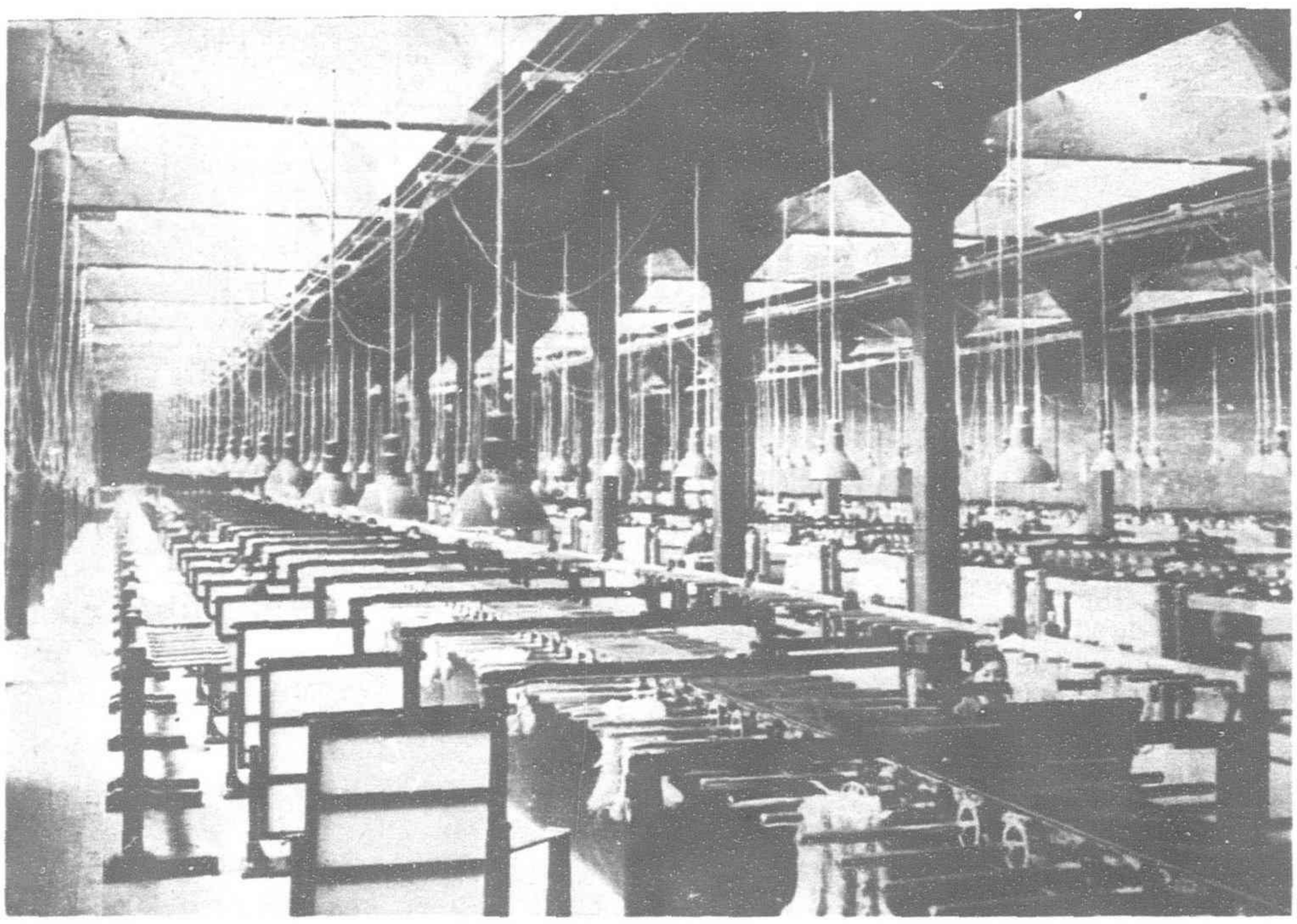
In the face of this flying increase of consumption, the domestic production was short of demand and a heavy import was inevitable with the result that a high level of market prices was maintained.

On the other hand, the rayon producers managed to reduce the cost of production in consequence of technical improvements, hence the substantial betterment of production conditions. The Teijin, among other companies, reported in 1923 a profit which corresponded to 43 per cent of the then paid up capital of the company. And, this was at a time when the acute post-War depression was prevailing.

It was but a natural outcome of such a boom that the Teijin and the Asahi, which were then the "whole show" of Japan's rayon industry, extended their respective production capacity in a big way. Meanwhile a number of new companies were promoted. The Mitsui House established the Toyo Rayon, the Dainihon and the Kurashiki Cotton Spinning Companies promoted the Nihon Rayon and the Kurashiki Kenshoku, while the Toyo Cotton Spinning Company opened a rayon factory which was later reorganized into the Showa Rayon Co., Ltd., and the Nihon Keori also started rayon manufacture at its Nagoya factory. All of these extension programs and inauguration of new companies were carried out between 1926 and 1927.

In addition to these new companies, a number of other new companies were planned though they did not materialize. Prominent among these plans were those contemplated by the Mitsubishi interests and the Kanegafuchi Cotton Spinning Company.

(*c*). *Reactional Depression* :—Following the materialization of all the extensions and new enterprises between 1926 and 1927, the rayon yarn output in Japan showed sharp increases. In 1928, when all the extended production capacity was put into operation, the annual output aggregated 16,500,000 lbs. (In 1923, the total was 780,000 lbs.)



The Rayon Yarn Selection Room of the Iwakuni Factory of the Teijin. Note special arrangements for lighting, the low hanging lamps all being sunlight lamps. Skilled operatives examine the quality of Royan Yarn and Sort it according to grade

In spite of such an abrupt increase in output, the supply was well consumed because of the sharp decline in imports and also the substantial rise in the fabric export. Nevertheless, the yarn market quotation registered continuous falls.

That the market quotation waned from Y.400 standard of 1923 to Y.200 level in 1928 (per case of 100 lbs., Teijin, 150 der. B.) was the very factor which stimulated the accelerating advances in yarn consumption at home and also the brisk fabric exports, but the phenomenon produced a decidedly unfavorable effect on the financial end of the enterprise, especially in the case of newly promoted companies.

Admitting that the promoters of these new companies knew better than working out their prospectus on the basis of the then current market quotations, the price went down even below their already conservative estimates. Moreover, they had a great deal more to learn in the technical end of their enterprise following the inauguration of actual production, although it is beyond doubt that they had conducted searching research experiments previously.

Lack of experience meant inferiority of finished products in quality, and it subsequently meant a still lower price as compared with the manufactures of the long established companies. In addition, the new companies were unable to realize their designed efficiency in production. In proportion, therefore, their cost of production was larger while the income through marketing their products was smaller as compared with the old companies.

In the face of this alarming development, the rayon companies were quick and decisive in taking measures to adjust conditions in their enterprise. New companies refrained from declaring dividends while old companies restricted the percentage thereof. For the interests behind these companies knew well that the failure of many industrial enterprises of those days had resulted mainly from the excess of dividends which were declared even by making financial make-shifts. The Toyo Cotton Spinning Co., Ltd., for instance, greatly undervalued the investments in its rayon factory before it separated the factory from the company's major enterprise and reorganized the rayon enterprise into an independent

concern, called the Showa Rayon Co., Ltd. The Nihon Rayon and the Kurashiki Kenshoku refrained from dividing their profit until their foundation was well established. Meanwhile the Teijin carried out a heavy business readjustment in connection with the downfall of the Suzuki House.

(*d*). *Second Phase of Development* :—As a relief for such an acute situation came the brisk export of rayon fabric, and a steady improvement of the rayon yarn market quotations. The margin of profit of the rayon companies subsequently became larger, it in turn bringing forth the second phase of development of the industry. Manufacturers invariably began extending their production capacity further to reduce cost of production.

According to the official returns of the Department of Commerce and Industry, the financial situation of the rayon industry in Japan showed the following developments during the five years ending in 1931 : (Unit : Y.1,000).

Years	*No. of companies*	*Authorized capital*	*Reserves*	*Net profit*	*Dividend*	*Net loss*
1927 ..	11	75,105	1,449	3,041	1,639	464
1928 ..	10	87,360	2,876	4,350	2,465	217
1929 ..	8	87,000	3,927	4,346	1,763	—
1930 ..	9	97,000	5,347	4,094	2,708	16
1931 ..	11	107,000	4,823	4,298	2,879	96

The outstanding situation of the rayon industry in Japan, especially since 1932 and 1933, however, is more active and favorable than is represented in the foregoing official returns.

It is shown in the foregoing table that the authorized capital of Japan's rayon companies increased from Y.75,000,000 in 1927 to Y.107,000,000 in 1931. This alone is impressive. But it is known also that the actual investments in this industry in Japan are much larger than their combined subscribed capital. The *Economist*, a bi-monthly, published by the Osaka Mainichi Publishing Co., Ltd., Osaka, estimates that the five leading companies, inclusive of the Teijin, Asahi, Nihon, Showa, and Kurashiki, alone invested almost Y.15,000,000 more than their combined total authorized capital. And, there are more companies of which the actual investments exceed their respective authorized capital. Another thing that is worthy of comment is that the annual profit of these five leading companies alone amounted to Y.10,000,000 in 1931 and Y.12,000,000 in 1932, as will be shown in the following table which is reproduced from the *Economist* :

2nd Half of	*Authorized capital*	*Actual investment*	*Profit*	*Profit percentage*	*Dividend*
1930	66,000	75,664	4,729	20.6%	1,560
1931	66,000	74,578	4,922	21.5%	1,567
1932	66,000	81,118	7,526	31.4%	2,441

Japan's rayon industry has thus made extraordinary progress during the past 10 years contrary to the recent declining tendency of the industry abroad. The combined total manufacturing capacity at the beginning of 1933 amounted to about 200,000 lbs. a day, or more than 70,000,000 lbs. per annum. And the production restriction which was in practice by agreement since November, 1929, was totally abandoned in December, 1932. Even then, the output could not fully meet with the demand which had immensely increased in consequence of an unprecedentedly active export of rayon fabric.

Second Phase of Program

It is under such prosperous circumstances that the second phase of an extension program on a large scale has come to be contemplated.

Previous to dealing with these extension plans, however, an outline of how the production and export have developed during the past years will be given.

(*e*). *Production and Export* :—That the rayon industry in Japan made a meteoric development becomes all the more remarkable when one carefully studies the statistics showing the yarn output and imports, listed below : (Unit : 1,000 lbs.)

Years	*Output*	*Import*	*Export*
1918	100	77	—
1919	140	75	—
1920	200	79	—
1921	250	138	—
1922	527	226	—
1923	780	952	—
1924	1,368	810	—
1925	3,200	833	—
1926	5,000	3,318	—
1927	10,500	800	—
1928	16,500	256	682
1929	26,368	625	1,161
1930	35,959	852	3,204
1931	46,684	1,166	2,575
1932	64,382	374	7,412

Note.—(1) The sudden increase of the import in 1926 resulted from the "dumping" of the Italian product in the Oriental market, and also, because Japan raised the import duties in April, that year, and the measure stimulated the speculative import previous to that date.

(2) The first exports in 1928 and 1929 were mainly re-exports carried out by importers who were after the drawback of the customs duty. The real export of rayon yarn started in and after 1930.

The exact figures of the rayon yarn consumption are not available. But the generally accepted formula, viz. : (output + import) — (export + stock) = consumption, indicates accelerating increases year after year. Moreover, in the early stage of the development of this industry in Japan, when the yarn export did not begin, the total of output and import almost entirely represented the domestic consumption.

That sharp increases were registered in consumption was due largely to the brisk export of the rayon fabric in view of the fact that the domestic consumption thereof was small. When it comes to weaving, the Japanese possess a peculiar art. The combination of this art and low wages easily enable the Japanese exporters to win in international competition against the European products.

At the time when the rayon industry in Japan was just beginning to make the first phase of development, silk weaving did not pay because of the then prevailing long depression. Meanwhile the weavers who changed from silk to rayon weaving not only found a way out of their difficulties but also reported a handsome profit. It eventually stimulated others to follow the example. Thus the weaving centers in Fukui, Gumma, and Tochigi Prefectures, as well as the weavers in other prefectures, turned to rayon weaving, this resulting in the meteoric development of this enterprise.

Because the rayon weaving industry is new and it has made such enormous progress, statistics of earlier days are not complete. It is recorded, however, that the 1928 production of rayon fabric totalled Y.15,000,000 in value and that it increased to Y.29,000,000 in 1929. The export of rayon fabric, too, increased from 13,000,000 square yards, valued at Y.8,000,000 in 1928, to 47,000,000 square yards, valued at Y.27,000,000 in 1929.

Mention must of necessity be made here of the fact that the Japanese rayon industry had started primarily as an export enterprise. When the rayon fabric, produced by weaving imported yarn, is exported, the drawback is granted on the import duties levied on the original yarn. Moreover, on the occasion of the domestic consumption, a consumption tax as "silk goods" is levied.

The following table, showing the semi-annual advances of the export trade of the Japanese rayon fabric, is the sum total of these various factors hitherto explained : (Unit : 1,000 square yards and Y.1,000).

RAYON FABRIC EXPORT

Periods	*Volume*	*Value*
1st half, 1928	3,631	2,700
2nd half, 1928	9,404	5,628
Total	13,035	8,328
1st half, 1929	17,636	11,148
2nd half, 1929	29,881	16,015
Total	47,518	27,163
1st half, 1930	40,387	17,667
2nd half, 1930	43,822	15,190
Total	84,209	32,857

Note.—In addition to the foregoing, there was the rayon "habutae" export as follows : 1928, Y.4,000 ; 1929, Y.1,003,000 ; and, 1930, Y.2,071,000.

In the annual comparison, the 1930 total was larger than that of 1928 by 6.4 times in volume and almost four times in value.

In the face of foregoing accelerating increase of the rayon fabric export, the first trade barrier appeared in British India in the form of import duties at the rate of 15 per cent *ad. valorem* both on the genuine and mixed rayon woven goods. And, it was soon followed by other countries as will be dealt with later.

In spite of such trade barriers, the rayon fabric export went on increasing with great stride as follows: (Unit: 1,000 square yards, and Y.1,000).

Years	*Ordinary rayon fabric*	*Rayon "Habutae"*
1931: Volume	94,853	5,583
,, Value	28,438	11,274
1932: Volume	152,638	11,129
,, Value	41,160	19,378

Of the total rayon fabric export in 1932, amounting to Y.60,000,000, 37 per cent or Y.22,000,000 was shipped to British India, the largest customer. Next to British India, the African countries, the Dutch East Indies, Egypt, and Australia were the principal destinations as seen in the following table:

1932 Rayon Fabric Export

Countries	*Volume (1,000 s.y.)*	*Value (Y.1,000)*	*Percentage (value)*
British India	92,572	22,554	37.2%
Dutch East Indies	59,393	13,643	22.5
Egypt	19,795	5,720	9.4
Eastern Africa	5,101	1,287	2.1
Southern Africa	12,189	3,127	5.1
Other Africa	8,559	2,043	3.3
Australia	8,319	2,887	4.7
Philippines	6,673	1,546	2.5
Straits Settlements	8,542	2,141	3.5
Total, including others ..	241,564	60,539	—

Note.—The export to Egypt and other African countries newly commenced in and after 1931. A considerable portion imported into British India is re-exported to African countries.

Another remarkable fact about Japan's rayon fabric export is that the Japanese supply constitute 99 per cent in British India and that the British supply is out of the question, although the conditions are different as regards the import into that country of the rayon and cotton mixed goods, as shown in the accompanying table: (Unit: 1,000 square yards).

Rayon Fabric Supply in British India

Periods	*Total*	*Japanese*	*Italian*	*British*
1930-31	23,080	22,559	102	95
1931-32	74,473	73,309	346	410
1932 (Apr.-Nov.)	79,942	79,185	112	295

Cotton and Rayon Mixed Woven Goods Supply in British India

Periods	*Total*	*Japanese*	*Italian*	*British*
1930-31	5,021	854	2,246	659
1931-32	10,166	1,240	4,866	1,236
1932 (Apr.-Nov)	7,799	1,737	3,291	1,966

Rayon Trade Barriers

Since Japan declared her withdrawal from the League of Nations, economic pressure, notably tariff revision apparently aimed at the restriction or shutting out of Japanese industrial manufactures, has been exercised against Japan by various countries. And British India stands out most conspicuously with her series of increases of customs duties on rayon manufactures, to say nothing of the proposed abrogation of the Indo-Japanese Convention, containing the most favored nation treatment.

British India has revised the rayon goods duties four times in succession since March, 1930, the latest measure having been taken in the early part of this year (The rayon customs bill was introduced in the Assembly on February 28, 1933, and it was subsequently passed and enacted). What is noteworthy about these tariff revisions in British India is that the increase of duties on the cotton and rayon mixed woven goods (of which the export from Japan to British India is relatively small) is considerably smaller in proportion than that on genuine rayon fabric.

In view of the fact that the rayon fabric export to British India is the bulk of trade, the restrictive measures taken in that country constitute a severe blow to the Japanese industry.

British India's first rayon import duty, 15 per cent *ad valorem*, took effect on March 1, 1930. The rate was raised to 20 per cent *ad valorem* in April, 1931. At the end of September, 1931, the third revision was made with a result that the rate on rayon fabric raised to 50 per cent (main tax, 40 per cent and surtax, 25 per cent) while the duty on the cotton and rayon mixed woven goods advanced to 34.375 per cent (main tax, 27.5 per cent and surtax, 25 per cent). The difference of 1 : 0.6875 between rayon fabric and the mixed woven goods was thus created, reportedly as the result of manoeuvres of the British rayon weavers in England.

The fourth and the latest revision stipulates: the following specific duties shall be levied on the import into British India of rayon fabric or rayon mixed woven goods (either cotton or silk):

1. On genuine rayon fabric, 4 annas per each square yard.
2. On mixed woven goods, 2 annas and 3 pies per each square yard.

The foregoing specific duties, when converted into that of *ad valorem*, signify, according to an explanation offered by the finance member of the Governor-General's Council, that 100 per cent duties are levied on the Japanese rayon fabric and from 26 to 32 per cent on identical goods of other countries, and that on the average, 47 per cent duties are levied on the Japanese mixed woven goods while from 32 to 46 per cent on identical goods from other countries (The *Economist*, March 15, 1933). The difference between the duties on rayon fabric and mixed woven goods exported from Japan to British India has thus been further enlarged to 1 : 5625.

In addition to British India, the customs duties on rayon manufactures were either newly created or revised in Canada, Egypt, South Africa, China, Australia, Malay States, and the Philippines all during 1932 as follows:

Canada (January, 1932, the import restriction act): the import duty is levied on the basis of an estimate of the lowest price in the exporting countries, delivery at factory, and rayon manufactures were estimated at $1.25 per lb.

Egypt (June, 1932, general revision): unbleached rayon fabric and bleached rayon "Yuzen," 200 millieme; others 250 millieme.

China (August, 1932, general increase): on rayon yarn, the duty was increased from taels 58 to taels 73 per picul; rayon fabric and mixed woven goods, the *ad valorem* duty increased from 45 to 70 per cent.

South Africa (October, 1932, partial increases): rayon fabric, of which the size is smaller than 30 inches, became dutiable at the rate of 3 pence per yard; ditto, of which the size is larger than 30 inches, became dutiable at rates proportionately higher than 3 pence per yard. Rayon underwear, male, 6 shillings per dozen, female, 4 shillings per dozen (The calculations on the basis of 75 sen per shilling find that the foregoing revision signifies the increase of duties from 22.5 to 74.5 per cent *ad valorem*).

Australia (October, 1932, general increases on silk goods): rayon fabric, from 35 to 40 per cent *ad valorem*; rayon hosiery and knitted goods, specific duty remains the same, but that which comes under the *ad valorem* duties, from 50 to 55 per cent. Rayon yarn, from 10 to 17.5 per cent *ad valorem*.

Malay States (October, 1932, partial revision): on rayon fabric, the duty was increased from 10 to 20 per cent *ad valorem*.

The Philippines (November, 1932, when exchange tariff rates established, 100 per cent duties abolished, and re-import prohibited): the duty on rayon fabric was increased from 50 to 60 per cent *ad valorem*, and rayon manufactures, from 50 to 65 per cent *ad valorem*.

Apart from these tariff revisions and increases listed above, latest overseas reports reveal that the Dutch East Indies and Batavia are contemplating checking flood of imports of Japanese industrial manufacturers into these countries, and that still other countries have similar plans.

In the face of such trade barriers, the Japanese producers are trying hard to find a way out of the situation. That the export to British India and to other British colonial possessions amounts to approximately 60 per cent of the entire rayon trade, and that the rayon manufactures are now included in the agenda of the forthcoming Anglo-India-Japanese Conference at Simla as well as that of the Anglo-Japanese parley in London are problems of great concern to Nippon producers.

Included among the counter measures hitherto advocated to cope with situation are: (1) the cultivation of new overseas markets; (2) the export of rayon yarn side by side with fabric; (3) the abolition of the domestic consumption tax to increase the demand within Japan; (4) further technical study of the cotton and rayon mixed weaving, and so on.

Latest Expansion Programs

In consequence of the phenomenal development in the past 10 years, the Japanese rayon fabric weavers claim that their product is unrivalled in point of qualitative superiority and low cost of production. Meanwhile the incessant increase of demand for rayon yarn resulting from the sensational expansion of export trade has not only stimulated the existing rayon companies to extend production capacity, it has also brought forth the promotion of altogether new companies. The rayon industry in Japan has thus entered the second phase of development, since the second half of 1932.

The combined total production capacity of the established rayon companies in Japan, at the beginning of 1933, stood at about 90 tons or approximately 200,000 lbs. a day, and it is going to be increased by about 40 tons to 130 tons per diem by the end of 1933 as the result of extensions to existing factories. In point of fact, part of the extension work has already been completed and the daily production in Japan thus increased.

On the top of these extension plans put into effect toward the end of 1932 or in the early part of 1933, there are plans of further extending production capacity. The Teijin, which added five tons to its daily output at the beginning of 1933, will shortly commence the construction of another factory in Hiroshima to add 10 tons a day. This projected Hiroshima No. 2 factory of the Teijin, upon completion, will have a maximum capacity of from 20 to 25 tons per day. Meanwhile the Asahi Kenshoku, which also increased the daily output by 5.5 tons early in 1933, is already building a new factory at Nobeoka to add five tons to its daily output by the end of 1933, and an additional five tons when the entire factory is completed.

What is more significant than the series of these extension programs of the existing companies is the promotion of five new companies which are already building factories.

Outstanding among these new companies is the Nihon Kagaku Kenshi (the Japan Chemical Silk) which was established in the summer, 1932, under joint investment of the Sumitomo House and the Kurashiki Interests. It is capitalized at Y.10,000,000 of which the 50,000 shares are owned by the Sumitomo, 100,000 shares by the Kurashiki Kenshoku (rayon), and the remaining 50,000 shares by the Kurashiki Boseki (cotton spinning). Its factory, which is under construction at the Sumitomo's reclaimed land of Niihama, Iyo province, Shikoku Island, is to be completed by the end of 1933 to produce 10 tons a day by the Viscose method.

That the establishment of this company attracted much attention is due to the fact that this is the first rayon enterprise in which the Sumitomo House has participated. It is recalled that the Mitsuis run the Toyo Rayon while that the Mitsubishis, through the Nihon Chisso (Nitrogen), controls the Asahi Kenshoku, the Nihon Bemberg, and the projected Nobeoka Cuprammonium Silk enterprise.

An outline of enterprises by four remaining new companies follows:

The Kinka Jinken (belonging to the financial clique of the Kinka Cotton Spinning Co., Ltd.): capital, Y.15,000,000; one quarter paid up; 235,000 shares out of the total of 300,000 owned by the Kinka Boseki group; factory, at Ujina, Hiroshima Prefecture; daily output, 10 tons, including two tons staple fibre; to start operation with five tons per diem, estimated rayon output being 32,300 cases, and staple fibre, 360 tons; the cost of construction, first phase of work, Y.4,500,000; calculating on the basis of marketing rayon yarn at Y.90 per case, the lowest estimated annual dividend, 10 per cent.

Nisshin Rayon (belonging to the financial clique of the Nisshin Cotton Spinning Co., Ltd.): capital, Y.10,000,000; one quarter paid up; invested under the joint auspices of the Nisshin Cotton Spinning Co. and the Yahagi Hydro-Electric Co., Ltd.; factory, at Okazaki, Aichi Prefecture; daily output, five tons, including two tons of staple fibre; maximum designated capacity, 15 tons per day; to open operation in the autumn, 1933.

Shinko Jinken (belonging to the financial clique of the Shinko Wool Weaving Co., Ltd.): capital, Y.10,000,000; 70,000 shares out of the total of 200,000 shares distributed among the Shinko shareholders, 100,000 shares among promoters, and 30,000 shares offered to public subscription; factory, at Naka-mura, Gifu Prefecture; daily output, 100 tons, all staple fibre.

Fukushima Jinken (belonging to the Fukushima Cotton Spinning Co.'s financial clique): capital, Y.7,000,000; two-thirds of shares owned by the Fukushima Company, and the remaining one-third taken over by promoters; factory, at Bofu-machi, Yamaguchi Prefecture; daily output, 20 tons; to start operation at five tons per day; to begin work early in 1934.

It goes without saying that there are more plans now contemplated in addition to the foregoing tangible programs which are already under way. For instance, the Kanegafuchi Cotton Spinning Co., Ltd., one of the most influential spinning concerns in Japan, which failed to participate in the rayon enterprise at the time of the first phase of expansion, has now a plan of promoting a rayon company, according to a public statement by Mr. Tsuda, President of the Company. Meanwhile the Okura House has a more tangible plan of establishing the Toyo Fibre Co., Ltd., a Y.10,000,000 concern, to open a staple fibre factory at Shimada-machi, Shizuoka Prefecture, to start operation when it is ready to turn out one ton a day.

A striking feature of these new expansion programs is that almost all of them plan to produce staple fibre, the new sensation of the fibre industry. A staple fibre, in a word, is artificial cotton or wool. The process of manufacture is exactly the same as rayon. Only, whereas the rayon is converted into rayon yarn, the staple fibre saves the trouble of converting it into yarns. Instead, it is left in the form of cotton. And, by mixing it with cotton or wool, a still new yarn is produced, and it opens a greater field for the cotton spinning industry. It is mainly on account of this fact that the cotton spinning companies are now interested in the rayon industry, especially the staple fibre enterprise.

Modernizing Jehol

Now that the capture of Jehol Province has been concluded and most of the "bandit gangs" have been suppressed, the Manchoukuo authorities, aided and advised by the Japanese, are making many plans for converting one of the most backward and poverty-stricken provinces of China, into a prosperous, modernized region.

In the first place Jehol boasts only 40 miles of railway—a branch line leading to the Peiapiao coal mines. It is planned to build 3,400 miles of track through the province within the next five years.

To-day there is in all the 54,000 square miles of the province no road worthy of the name and bridges are few. Most of the so-called roads are fit only for two-wheeled carts and camel caravans. The new highway program for Jehol calls for building 10,000 miles of modern automobile roads within the next five years.

General Tang Yu-lin, the erstwhile Chinese Governor of Jehol, waxed rich by forcing the peasants to plant opium poppies. Land not planted to poppies was taxed at a fearfully high rate. The Manchoukuo authorities plan a Government opium control and a gradual reduction of the poppy-growing area.

Meanwhile agricultural experimental farms are to be established, similar to those which the Japanese have maintained for years along the South Manchuria Railway.

The Jehol currency has been in a deplorable state, with millions of dollars of unsecured paper money circulating far below the fictitious face value. This depreciated currency is already being rapidly retired, and is being replaced by banknotes of the State Bank of Manchoukuo carefully maintained at par.

Jehol is a potentially rich province, and is very beautiful scenically. For two centuries Chengtefu, the provincial capital, was the summer resort used by the Manchu Emperors. Fish and game abound in the province, and until the Manchu court became effete the Emperors used to enjoy great hunting expeditions in the Jehol mountains.

Jehol is also rich in minerals, and after the railways and highways have been built considerable mining activity is expected.

Heretofore most of Jehol's import and export trade has gone through the passes in the Great Wall, and has helped to keep Peiping (Pekin) and Tientsin prosperous. In future all the Jehol trade routes will lead westward to Chinchow or to Tangliao in Manchuria, and Hulatoa, Newchwang and Dairen will be Jehol's seaports, instead of Tientsin and Chingwantao.

Antimony Production in China*

THE districts in China where antimony is found include Hunan, Hupeh, Kwangtung, Kwangsi, Yunnan, Kweichow, Szechuen and Kiangsi, with the first-named leading in production. In 1908 the total antimony production in China represented about 50 per cent of the world output, and made a further increase during later years, amounting to over 80 per cent of world production. According to Mr. Tegengren, antimony production in Hunan province represents over 90 per cent of China's total output, and among producing districts Sikwangshan is the chief center, estimated to have reserves in the ground equal to 1,500,000 metric tons of pure metal, of which deposits only one-tenth have been so far worked.

The method of mining followed in Hunan is very simple. A hole is drilled into the rock forming the side of a hill, and an explosive charge inserted and fired. Then, with pickaxe and spade, the broken rock is removed and the same simple process repeated to drive the cutting into the hillside. There is rarely any water in the mines, and pumping is therefore not necessary, for when rain gets in it can be baled out with wooden buckets. Fresh air is supplied to the cuttings through bamboo pipes fitted with wooden pistons, or by a cog-wheel mechanism designed to keep the air circulating. Sometimes, when the vein is not very deep, direct communication can be had with the surface through small shafts connected with the inclines.

Ore-dressing is also a very simple process by local methods. The large lumps of rock are broken with iron hammers, and the fine particles of ore separated by passing through sieves made of very fine bamboo. Washing leaves the ore particles at the bottom of the sieve, and the deposit at this stage contains about 60 per cent of pure metal.

Originally this precipitate was sent to Changsha and Hankow to be converted into antimony oxide, but realizing the large profit made in handling pure antimony the mining companies started modern smelting-plants. During the World War there were many such plants operating in Hunan, but since 1918 trade in antimony has decreased, resulting in a heavy fall of prices. Antimony enterprises in Hunan were seriously affected, and small plants with only limited financial resources had to close down. The concerns remaining in operation are the native smelting-plants.

Antimony ore is smelted in a very simple form of furnace, rectangular in shape and containing eight earthenware pots, arranged in two rows, four to hold the ore and four to collect the melted antimony. There are holes at the bottom of the pots in the front row, which are placed immediately above holes in the sides of the pots in the back row. The molten metal in the first set of pots flows into the second set, the whole process taking about two hours. This form of smelting-plant dates back to about 1908, when the Hwa Chang Company was established.

There are no statistics available showing the actual antimony output in Hunan, as many mining companies do not keep any records of production, so that what little can be learned about the matter is from the records kept of exports. The following tables give a rough estimate of the antimony production in China and the world, and of Hunan's share in China's production and world output, quantities being expressed in metric tons:

ANTIMONY PRODUCTION IN CHINA, HUNAN AND THE WORLD

	World	*China*	*China's Share of World Output*	*Hunan*	*Hunan's Share of China's Output*	*Hunan's Share of World Output*
1911 ..	21,523	10,400	48.3%	—	—	—
1912 ..	24,236	13,530	55.8%	—	—	—
1913 ..	20,869	13,032	62.4%	—	—	—
1914 ..	22,878	19,647	85.7%	—	—	—
1915 ..	37,772	23,357	61.9%	—	—	—
1916 ..	70,019	42,800	61.2%	—	—	—
1917 ..	54,872	28,459	51.8%	27,576	96.8%	50.2%
1918 ..	29,737	18,120	60.9%	16,459	90.8%	55.3%
1919 ..	12,063	8,466	70.2%	8,392	99.0%	69.6%
1920 ..	18,264	13,432	73.5%	13,073	97.1%	71.5%
1921 ..	17,410	14,658	84.1%	13,627	93.0%	78.2%
1922 ..	17,714	13,858	78.2%	13,096	94.5%	73.9%
1923 ..	18,416	14,244	77.4%	14,064	98.6%	76.4%
1924 ..	18,967	12,826	67.6%	12,761	99.4%	67.3%
1925 ..	25,777	19,496	75.7%	18,427	94.5%	71.6%
1926 ..	29,407	20,926	71.1%	18,853	90.1%	64.1%
1927 ..	28,351	17,986	63.5%	17,290	96.1%	61.0%
1928 ..	28,600	19,324	67.6%	19,066	98.3%	66.6%
1929 ..	31,759	22,401	70.6%	21,370	95.4%	67.3%
1930 ..	—	17,467	—	17,458	99.7%	—

From the above it will be seen that China supplies about 70 per cent of the world production, and Hunan about 90 per cent of China's output. In other words, Hunan is the main source of world supply, and about 50 per cent of the export from China is sent to the United States.

Prices of Hunan antimony vary with world conditions. Prior to 1904 the price ranged from 6 to 10 cents gold a pound, increasing to 23 cents during the Russo-Japanese War. After peace was restored in 1905 the market for antimony weakened, but when the Great War started in 1914 prices showed an immediate advance, and had increased to over 40 cents gold, but in 1922 only 4½ cents was obtained per pound. The following table shows the price fluctuation during the twenty years ending 1930; quotations being expressed in gold cents per pound:

ANTIMONY PRICES 1911-1930

	Highest	*Lowest*	*Average*
1911	9.00	6.82	7.54
1912	9.30	6.83	7.76
1913	8.77	6.05	7.42
1914	14.14	6.03	8.53
1915	39.36	15.24	29.52
1916	43.87	11.57	25.33
1917	34.66	13.90	20.73
1918	14.23	8.19	12.55
1919	9.56	6.83	8.16
1920	11.37	5.75	8.48
1921	5.50	4.50	4.96
1922	7.00	4.25	5.47
1923	9.25	6.35	7.89
1924	14.12	8.37	10.83

Chinese Economic Journal

WORLD PRODUCTION OF ANTIMONY (1911-1930)

	China	*Bolivia*	*Mexico*	*France*	*Algeria*	*Australia*	*Austria*	*Czecho-slovakia*	*Italy*	*Turkey*	*Jugo-Slavia*	*India*	*Other Countries*
1911	10,400	150	4,166	4,683	—	622	840	—	285	—	—	—	337
1912	13,530	40	3,500	1,910	1,417	632	2,032	—	310	—	—	—	865
1913	13,032	24	937	5,170	186	970	—	—	—	—	—	—	550
1914	19,647	82	1,047	540	320	910	—	—	—	—	—	—	332
1915	23,357	7,888	739	893	2,740	1,700	—	—	—	—	—	5	450
1916	42,800	12,060	829	2,430	8,940	1,730	—	—	—	—	—	400	830
1917	28,450	10,288	2,647	2,354	4,550	1,195	1,169	—	689	—	—	61	3,469
1918	18,120	3,010	3,279	1,329	2,218	652	—	—	404	—	—	—	725
1919	8,466	105	471	998	723	561	220	—	10	—	—	2	507
1920	13,432	484	623	1,130	1,000	487	423	—	187	—	—	—	498
1921	14,658	282	45	1,270	103	191	384	—	76	—	—	1	400
1922	13,858	185	464	834	579	605	139	100	146	400	—	—	404
1923	14,244	312	490	691	500	421	62	453	271	400	131	—	441
1924	12,826	621	775	1,027	905	130	1	1,066	372	400	414	—	430
1925	19,496	1,384	935	964	1,461	66	—	535	312	400	139	5	80
1926	20,926	3,503	1,783	586	334	37	87	938	360	400	182	53	218
1927	17,986	3,214	2,098	714	442	53	857	1,586	285	400	279	244	193
1928	19,324	2,834	2,297	925	21	50	914	967	230	400	258	181	199
1929	22,401	3,023	2,709	1,025	114	26	560	556	306	400	313	38	288
1930	17,467	927	3,032	1,106	—	42	—	—	330	400	—	—	—
Total ..	364,420	50,416	32,866	30,579	26,553	11,120	7,688	6,201	4,573	3,600	1,716	990	11,216

	Highest	*Lowest*	*Average*
1925	20.25	11.25	17.49
1926	23.75	9.50	15.99
1927	15.00	10.75	12.39
1928	11.37	9.50	10.30
1929	9.75	8.25	8.96
1930	8.87	6.75	7.67
20 years	43.87	4.50	11.89

Among the industrial uses of antimony the most important are the manufacture of type metal and Babbit and anti-friction metals. In normal times over 60 per cent of the total production is used in these ways, the balance being employed in the manufacture of ammunition, enamelware, glass, rubber, matches, dyestuffs, and electric appliances. During the Great War the price of antimony increased so enormously that substitutes were sought and discovered, and are largely used to-day in regard to military requirements.

The United States imports annually from China about 10,000 tons of antimony, and the following table shows China's share in American imports, quantities being expressed in metric tons :

American Imports of Antimony from China

	Antimony "ore"	*Antimony "Regulus"*	*Antimony Oxides*	*U.S. Total Imports*	*China's Exports to U.S.A.*	*China's Share in U.S. Imports*
1921..	321	9,210	140	—	—	—
1922..	626	8,450	344	9,420	6,314	67.10%
1923..	758	6,150	2,070	9,920	7,523	75.80%
1924..	508	6,170	1,098	8,603	4,445	51.70%
1925..	691	8,965	1,630	11,989	8,691	72.50%
1926..	1,853	10,460	2,054	15,774	9,586	60.80%
1927..	980	9,000	1,640	13,452	7,971	59.30%
1928..	1,099	8,800	2,402	14,289	7,451	51.80%
1929..	1,640	10,070	1,929	15,335	9,199	60.00%
1930..	648	7,000	712	9,145	6,182	67.50%

The export of antimony from China is mainly in the hands of foreign firms. Usually these exporters have an agreement with Chinese dealers regarding acceptance of their stocks, and the more important points in such contracts are the following :—

No ore containing less than 98.75% of antimony regulus shall be accepted. Supplies which fail to come up to the standard stipulated in the contract shall be liable to deduction in price as follows:

Antimony (98.9%)	2% discount
,, (98.8%)	4% ,,
,, (98.75%)	5% ,,
,, (below 98.75%)	not accepted

Inspection and analysis are necessary before a deal is concluded, in order to prevent misrepresentation or adulteration.

The purchaser may reject any inferior portion of a consignment.

Payment shall be only after a consignment has been analyzed

Antimony produced in Hunan is mostly over 99 per cent pure. The following table shows the result of analysis of Hunan antimony regulus, carried out by the Hankow Bureau of Inspection and Testing of Commercial Commodities :—

Analyses of Hunan Antimony

Trade Mark	*Antimony*	*Arsenic*	*Lead*	*Sulphur*
Mitsui	99.36%	0.17%		
,, ...	99.54%	0.13		
,, ...	99.60	0.12		
,, ...	99.35	0.12		
,, ...	99.24	0.15		
Schnabel Gaumer	99.47	0.13	0.01%	0.23%
,, ,, ...	99.40	0.28	0.03	0.14
,, ,, ...	99.36	0.14	0.01	0.23
Mitsui	99.49	0.18		
Schnabel Gaumer	99.54	0.19	0.01	0.23
,, ,, ...	99.42	0.16	0.02	0.19
,, ,, ...	99.30	0.20	0.02	0.35
,, ,, ...	99.47	0.10	0.01	0.21
,, ,, ...	99.47	0.17	0.02	0.31
,, ,, ...	99.60	0.11	0.02	0.18
Chia Pah	99.61	0.10		
Schnabel Gaumer	99.52	0.15	0.01	0.27
,, ,, ...	99.47	0.20	0.01	0.23
,, ,, ...	99.57	0.18	0.02	0.10
,, ,, ...	99.36	0.20	0.02	0.40
,, ,, ...	99.57	0.23	0.02	0.14
,, ,, ...	99.64	0.13	0.02	0.12
Chia Pah	99.57	0.16	0.02	0.12
Schnabel Gaumer	99.44	0.22	0.02	0.20
,, ,, ...	99.50	0.19	0.04	0.11
,, ,, ...	99.32	0.27	0.02	0.27
,, ,, ...	99.38	0.25	0.02	0.15
,, ,, ...	99.41	0.26	0.01	0.13

Trade Mark	*Antimony*	*Arsenic*	*Lead*	*Sulphur*
Schnabel Gaumer	99.48	0.13	0.02	0.15
,, ,, ...	99.30	0.18	0.01	0.33
,, ,, ...	99.36	0.20	0.01	0.28
Chia Pah	99.39	0.20		
Schnabel Gaumer	99.32	0.25	0.02	0.24
,, ,, ...	99.47	0.14	0.02	0.16
,, ,, ...	99.18	0.29	0.02	0.41
,, ,, ...	99.36	0.29	0.02	0.22
,, ,, ...	99.39	0.20	0.06	0.21
,, ,, ...	99.36	0.23	0.02	0.23
Siemssen	99.33	0.26		
Schnable Gaumer	99.38	0.23	0.02	0.18
,, ,, ...	99.50	0.16	0.04	0.04
,, ,, ...	99.46	0.14	0.04	0.06
,, ,, ...	99.29	0.29	0.02	0.22
,, ,, ...	99.26	0.15	0.02	0.36
,, ,, ...	99.38	0.24	0.06	0.16

	Highest	*Lowest*	*Average*
Antimony	99.64%	99.18%	99.42%
Arsenic	0.29	0.10	0.19
Lead	0.06	0.01	0.02
Sulphur	0.41	0.04	0.21

Analyses of Antimony Ore

During recent years antimony ore has figured among the exports from Hunan, the results of analysis being as follows :

Trade Mark	*Antimony*
Chia Pah	70.64
Schnabel Gaumer	69.39
Chia Pah	71.11
Schnabel Gaumer	71.08
,, ,, ...	66.82

	Highest	*Lowest*	*Average*
Antimony	71.11%	66.82%	69.81%

Bolivia is the world's second largest producer of antimony, with Algeria and France coming next in order. The output in France, however, is very limited and largely absorbed for domestic consumption. Possible competitors with China in the antimony market are Bolivia, Mexico and Algeria, but owing to heavy production costs the output of these countries is not constant, varying considerably with market conditions. While China still leads the world in production of antimony, production on a larger scale is not feasible unless more modern and scientific methods are adopted.

Development of Manchoukuo

Manchoukuo awards the South Manchuria Railway Company the contract for the construction of railways between Tunhua and the Tumen river, between Lafa and Harbin and between Taitung and Hailun, at a cost of one hundred million yen.

The ten-year plan launched by the new State of Manchoukuo consists of four basic principles, has given first thought to transportation facilities, and proposes construction of 4,000 kilometers of new railways every ten years, so that finally 25,000 kilometers of railways will materialize. Harbor improvements will also be considered. Facilities of the Antung and Yingkow harbors will be improved and the Hulutao harbor will be completed when economic developments necessitate. Roads will be constructed or repaired so that in ten years there will be 60,000 kilometers of good roads. Telephone services will be opened in all principal cities. Air transportation has been entrusted to the Manchuria Air Transportation Company. Model cities will also be constructed at Changchun, Mukden, Harbin, Kirin, Tsitsihar and other places. Manufacturing districts will be opened at Mukden, Antung, Harbin, and Kirin. Manchoukuo's ten-year plan is launched on the following principles :—

1. The practice of one class monopolizing the profit gained by exploiting natural resources and developing industries will be abolished to distribute the benefit to all.

2. National control and rational management are to be applied to important industries.

3. Capital is invited from all countries, according to the principle of the Open Door and equal opportunity.

4. Importance is to be given to relations with Japan, in order to effect a closer mutual relation.

The New Motor Passenger Ship "Aoi Maru"

Vessel for Excursions in Bay of Tokyo to Oshima and Shimoda is Equipped with Mitsubishi Four-Cycle, Solid Injection, Trunk Piston Diesel Engine

THE *Aoi Maru* has been built by the Kobe Shipyard and Engine Works of the Mitsubishi Shipbuilding and Engineering Co., Ltd., to the order of the Tokyowan Kisen Kaisha for their Oshima-Shimoda passenger service with Tokyo as the starting port. Oshima Island is famous for its active volcano, called Mount Mihara, while Shimoda on the Izu Peninsula is a place of historic interest and noted for its hot springs.

The vessel was laid down on December 5, 1932, launched on April 12 and completed on June 8, 1933.

The principal particulars are as follows :—

Length between perpendiculars	58.52 meters
Breadth moulded	9.75 ,,
Depth moulded	5.03 ,,
Draught loaded	2.90 ,,
Gross tonnage	937.63 tons
Speed on trial	14.783 knots
Number of passengers	650

Main Engine :—One set of Mitsubishi Four Cycle, Airless Injection, Trunk Piston, Diesel engine of type PRH6 with a normal output of 900 b.h.p. at 260 r.p.m.

Fuel oil tank capacity :—About 50 tons.
Fresh water tank capacity :—About 50 tons.

General Arrangement

The vessel has a slightly raked bulb stem and a cruiser type stern, the hull being subdivided into five watertight compartments by four transverse bulkheads, and the engine room is situated amidships. There are a large funnel of oval shape on the top of engine room casing and two masts, which are properly raked, at fore and aft of the ship.

On the upper deck forward is the dining saloon. The deck houses surrounding the engine room casing are utilized for toilets on the starboard side and lavatories on the port side. On the aft part of the upper deck is situated the passengers' common room. The purser's room is arranged at the left of the entrance of the passengers' common room and a guide bureau and a canteen at the right of that entrance.

On the promenade deck forward is the social room and dance hall, whilst the aft deck is utilized for a verandah and a promenade space.

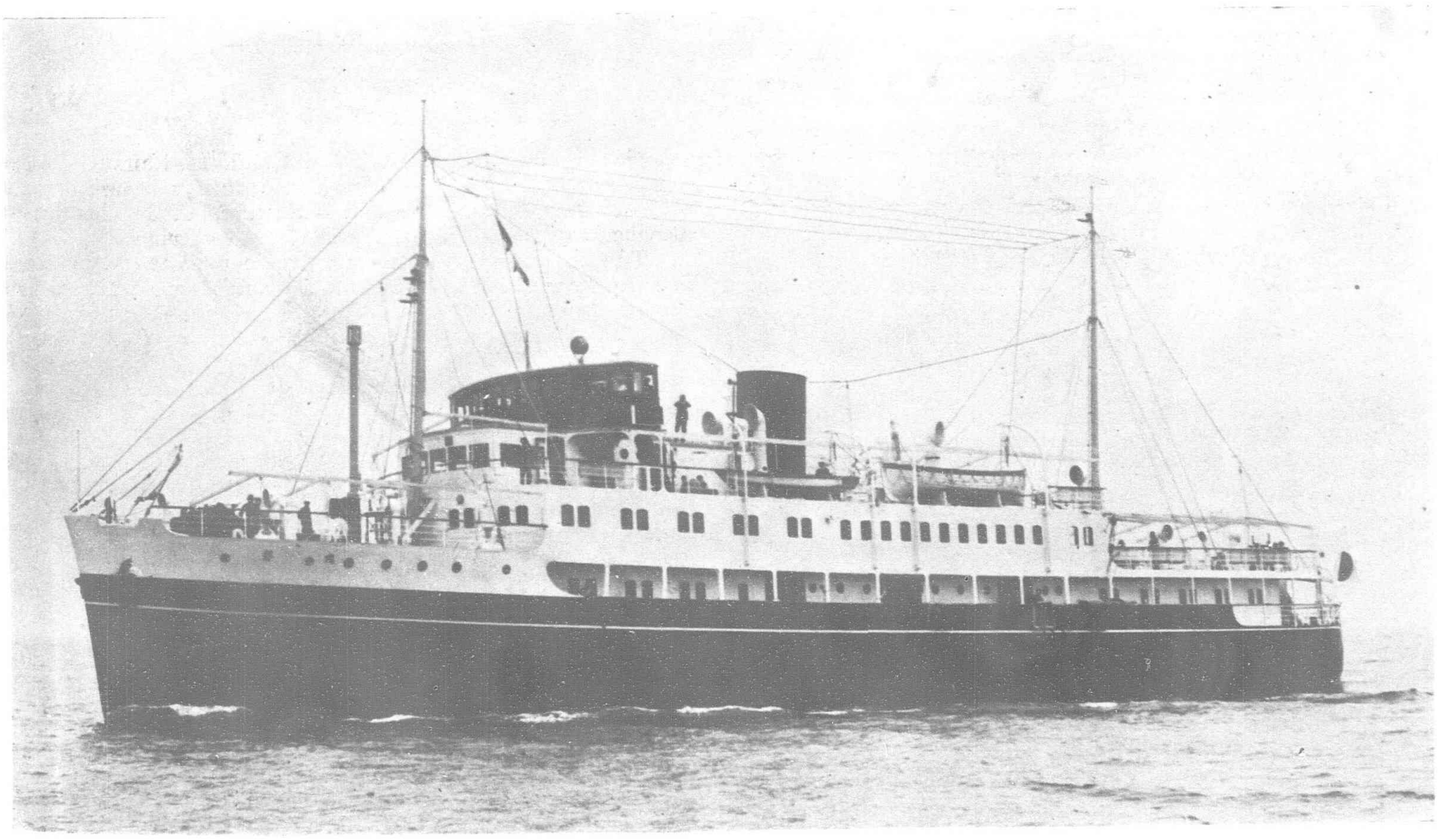
On the boat deck is arranged a special room at the foremost part while abaft the social room, are the captain's room, chief engineer's room, and wireless operator's room.

On the navigation bridge which is arranged over the fore deck house on boat deck, is a steering compartment.

The second deck forward is for the European special rooms, baths, lavatories and crew's quarters, and at the aft part of the deck are arranged the Japanese special rooms. In forecastle there are a chief engineer's room, a first engineer's room, boatswain's and quartermasters' rooms, an officers' mess room, a galley, a lavatory and bath rooms. An electric steering gear room is situated at the aftmost part of the second deck.

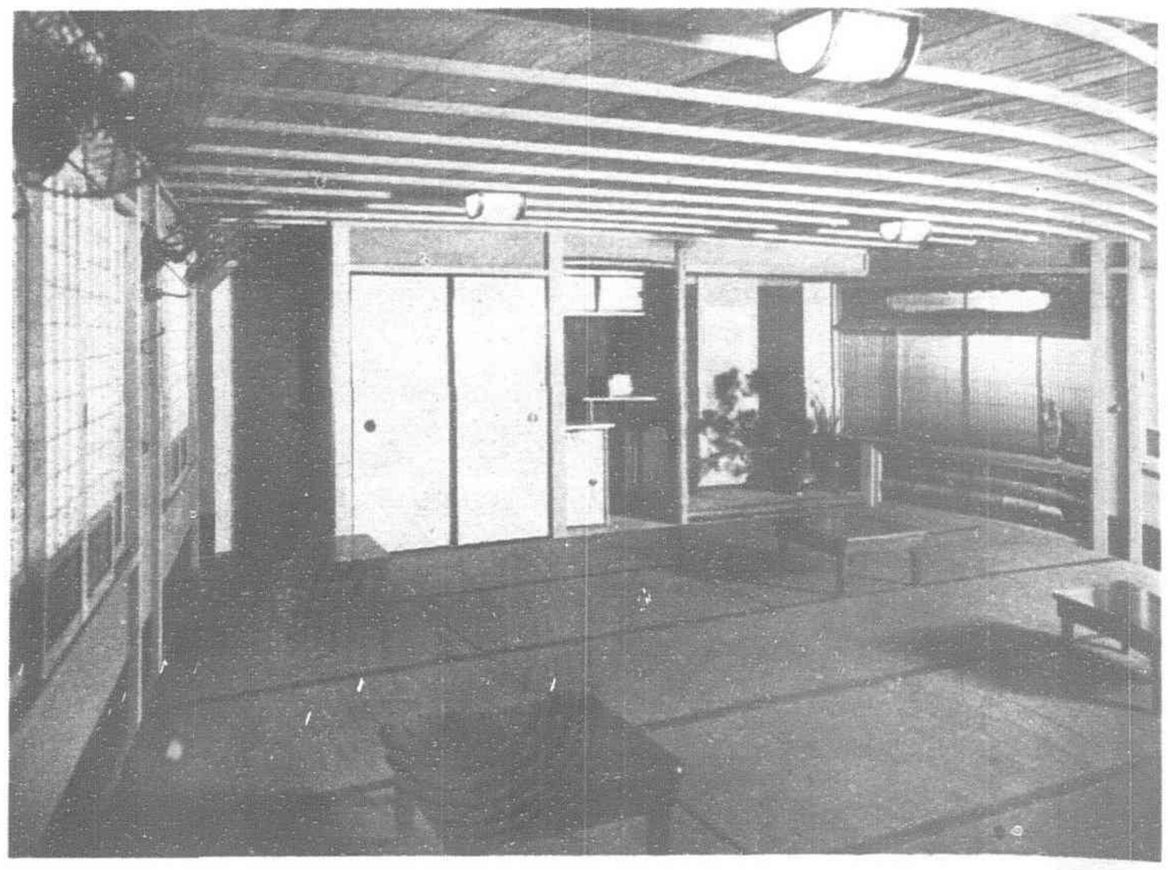
Passengers' Accommodation

Special endeavor has been made to ensure passengers' satisfaction in the design, decoration and equipment of the private and public rooms as well as in general accommodations.



The Motorship "Aoi Maru" on trial runs

Social Room of the "Aoi Maru"



Special Room (Japanese Style), "Aoi No Ma"

The social room and dance hall is so spacious as to extend the whole breadth of the vessel and there are no pillars employed. The decorations are of modern French style, and the surrounding windows are of large Mitsubishi patent watertight type. The floor is of parquet and, when necessary, a decorated carpet is laid. Many comfortable metal tube chairs and tables are provided. A loud speaker is fitted near the sideboard at the fore part of the room, and a bar occupies a place in front of the staircase. As a whole the scheme is modern and full consideration has been taken to give lightness and brightness to the room.

On the port and starboard sides behind the social room, there are provided reversible sofa seats (so-called "Romance Seats" in Japan) similar to those fitted in the second class Japanese Government Railway Cars. The floor is rubber tiled, and the walls are panelled with maple wood. The windows are large sized as in the social room, and the passengers can enjoy the changing scenery of the sea while reposing on the sofas.

Common Room

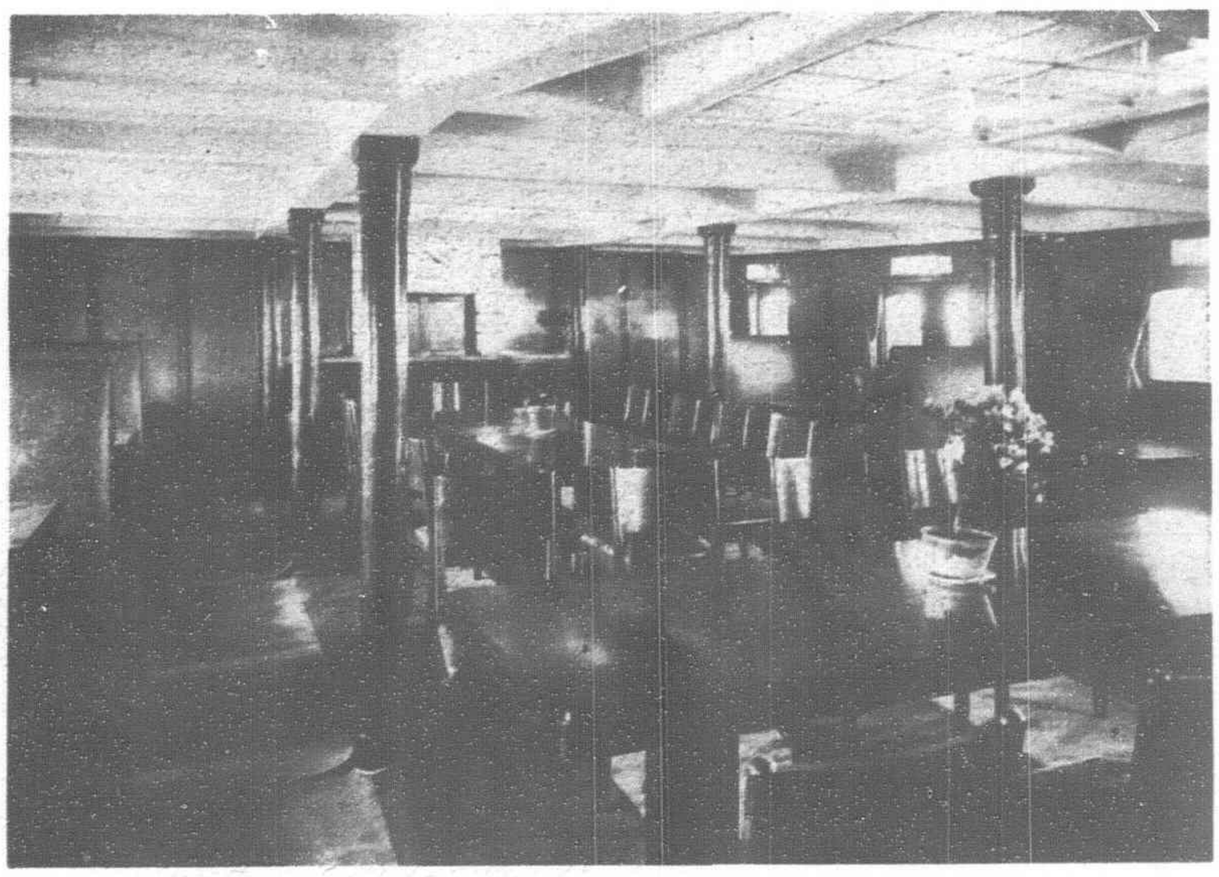
The dining saloon is tastefully decorated in modern French style, and is provided with tables, chairs and sofas which are well matched. A loud speaker is fitted also in this room. The pantry is situated at the front and has large cold storage equipment.

The passengers' common room on the upper deck aftward is done in classic style of staid appearance. The floor is made of Japanese matting ("tatami") on the top of which carpets of neat design are laid. A loud speaker is installed also in this room.

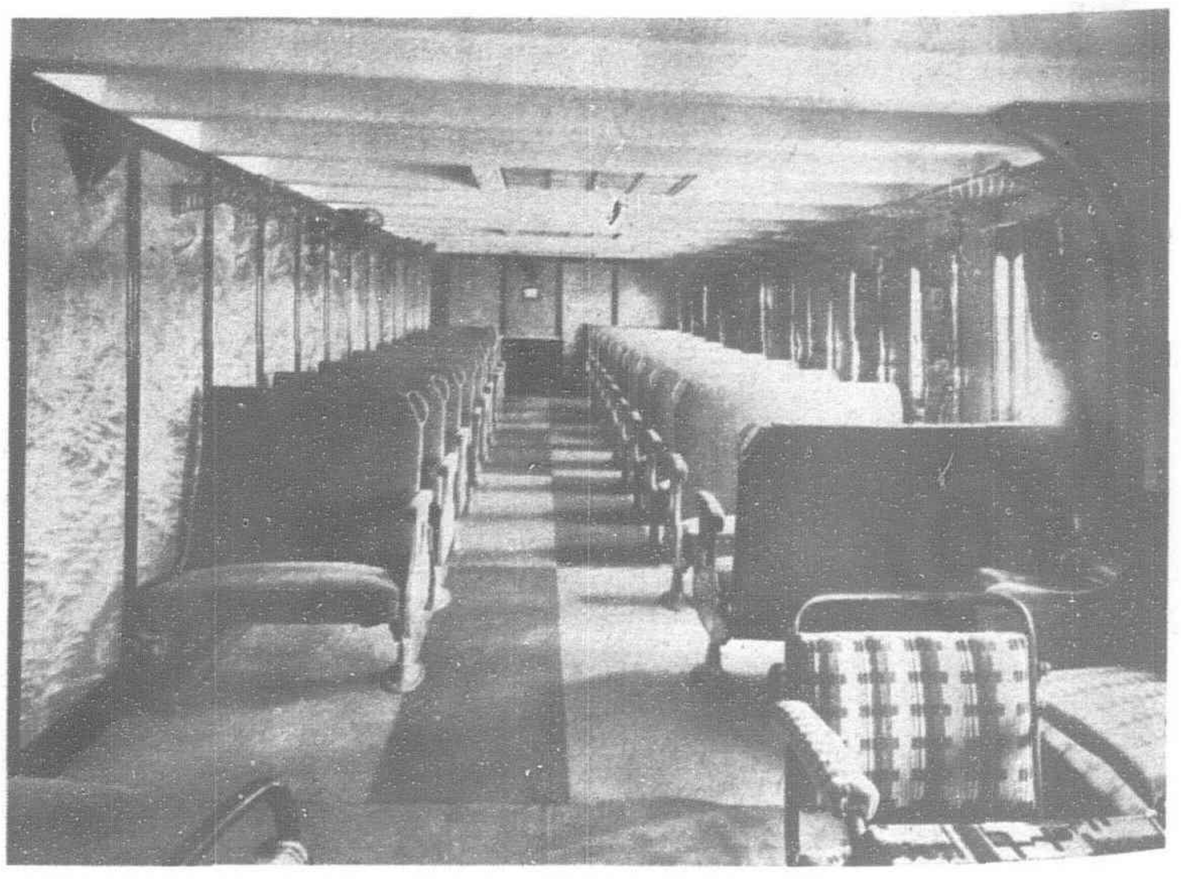
The guide bureau is provided with a gramophone, radio apparatus and a microphone. Dance music, news, and all kinds of announcements to passengers are transmitted from here through the loud speakers provided in each room.

The European special rooms, eight in number, on the second deck, are each provided with comfortable sofa, berths, chairs and table. Each room is well ventilated and a wash basin with fresh water supply is fitted. Bath room and lavatory are for the use of special class passengers, and are laid with tiles. A dressing room is attached to the bath room.

The Japanese special rooms, five in number, on the second deck, are each decorated in pure Japanese style with an alcove



Dining Room



Sofa Seats

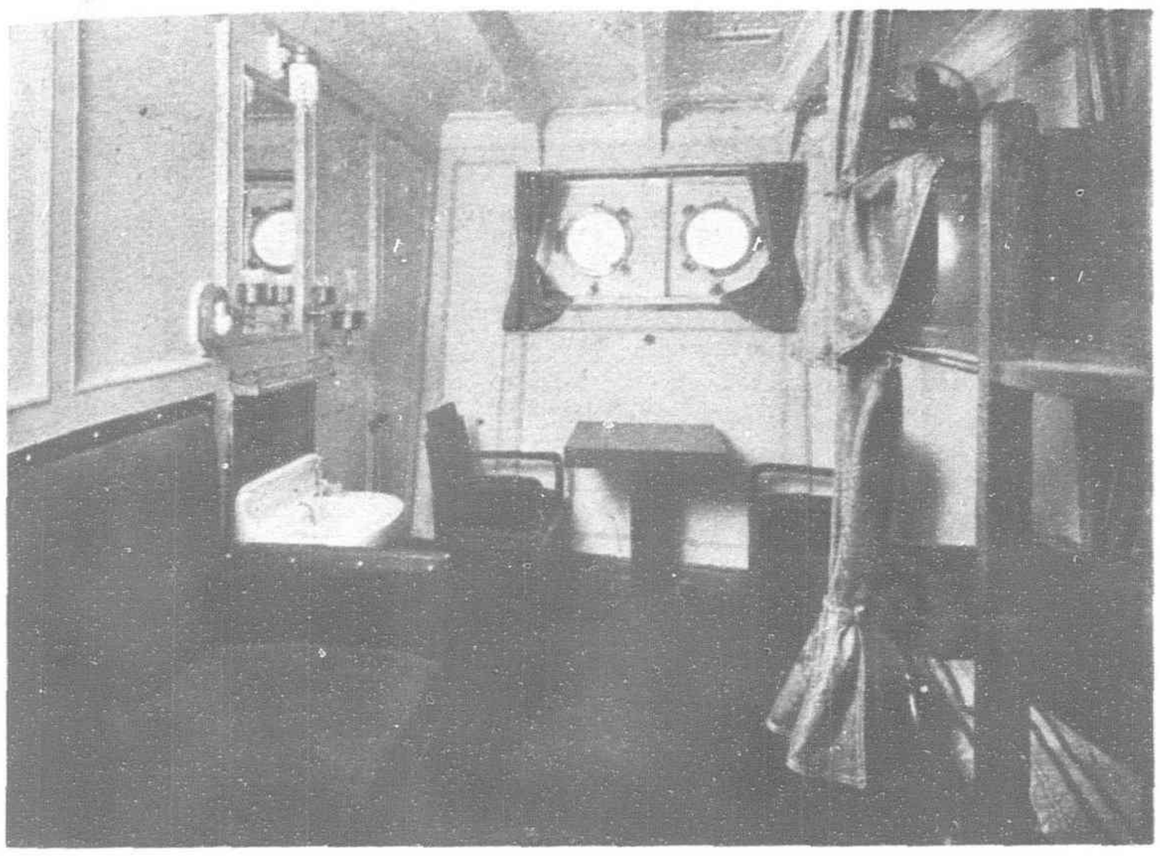
("Toko") and wardrobe ("Oshiire"), and have floors of "tatami." The largest room, called "Aoi-no-ma," associated with the name of the ship, is spacious and has a tasteful porch erected at the entrance. A loud speaker is installed also in this room.

The galley is provided with two oil ranges, rice boilers and a boiler for exclusive use of the galley which supplies also steam for the baths independently of the donkey boiler in the engine room.

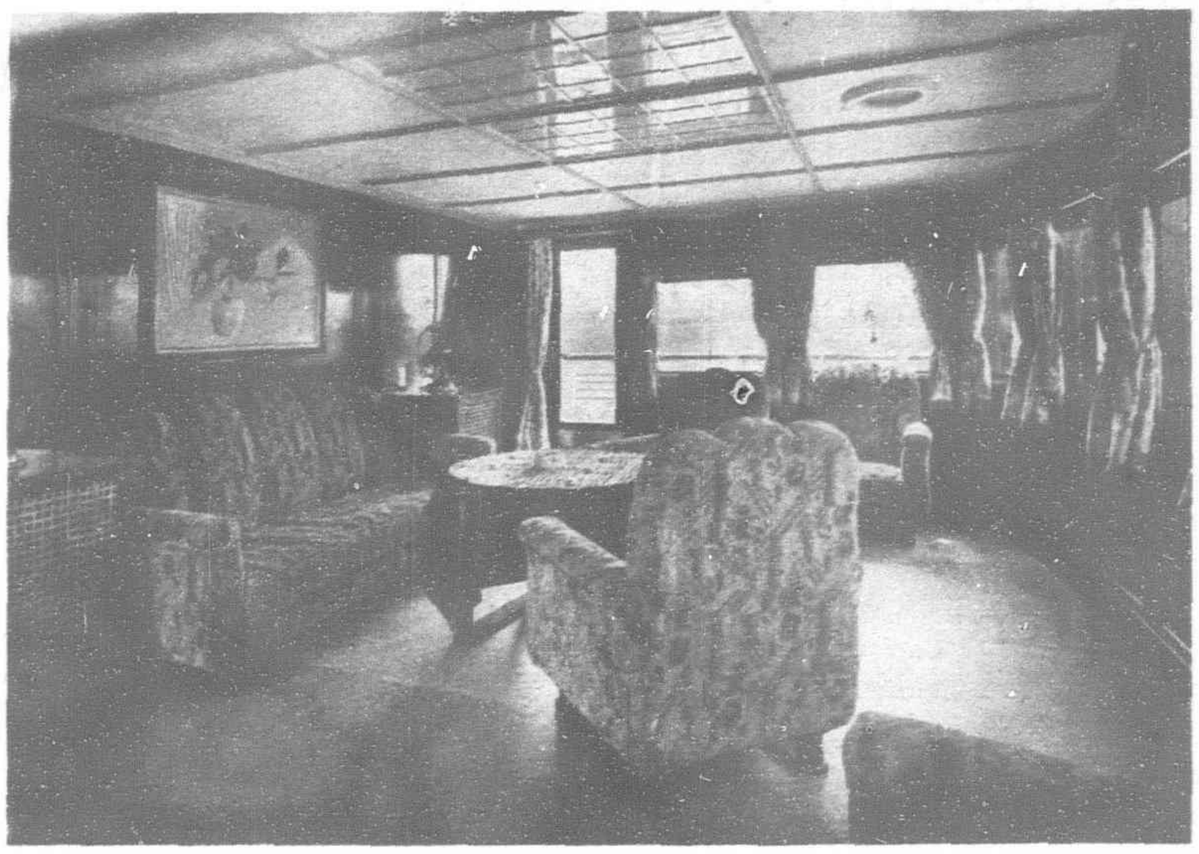
In crew's quarters, there are provided oilers, cooks', and boys' accommodations which are well ventilated and lighted.

Behind the "Aoi-no-ma," there is a room for five so-called, "marine boys" who, besides performing general service on board, form the ship's orchestra.

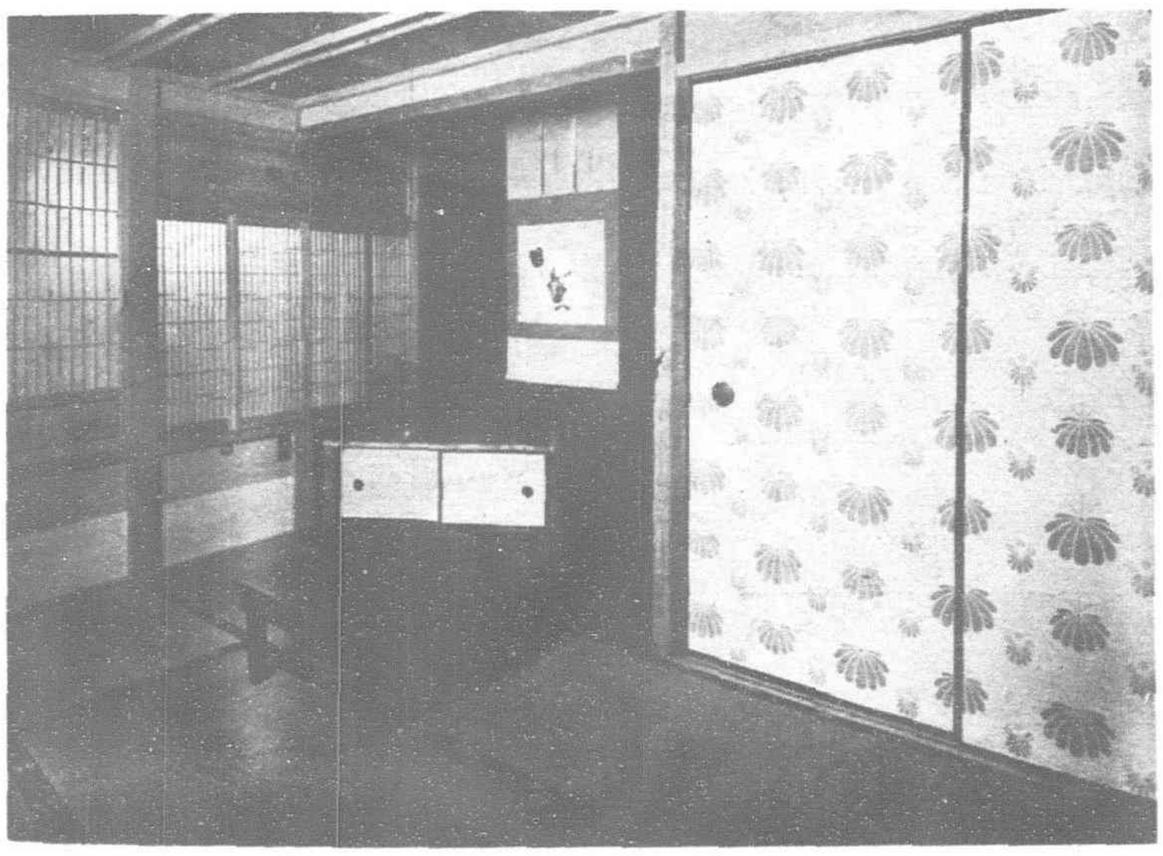
In front of the cargo hold is situated a provision store. The communication between the store and the galley is by means of a lift.



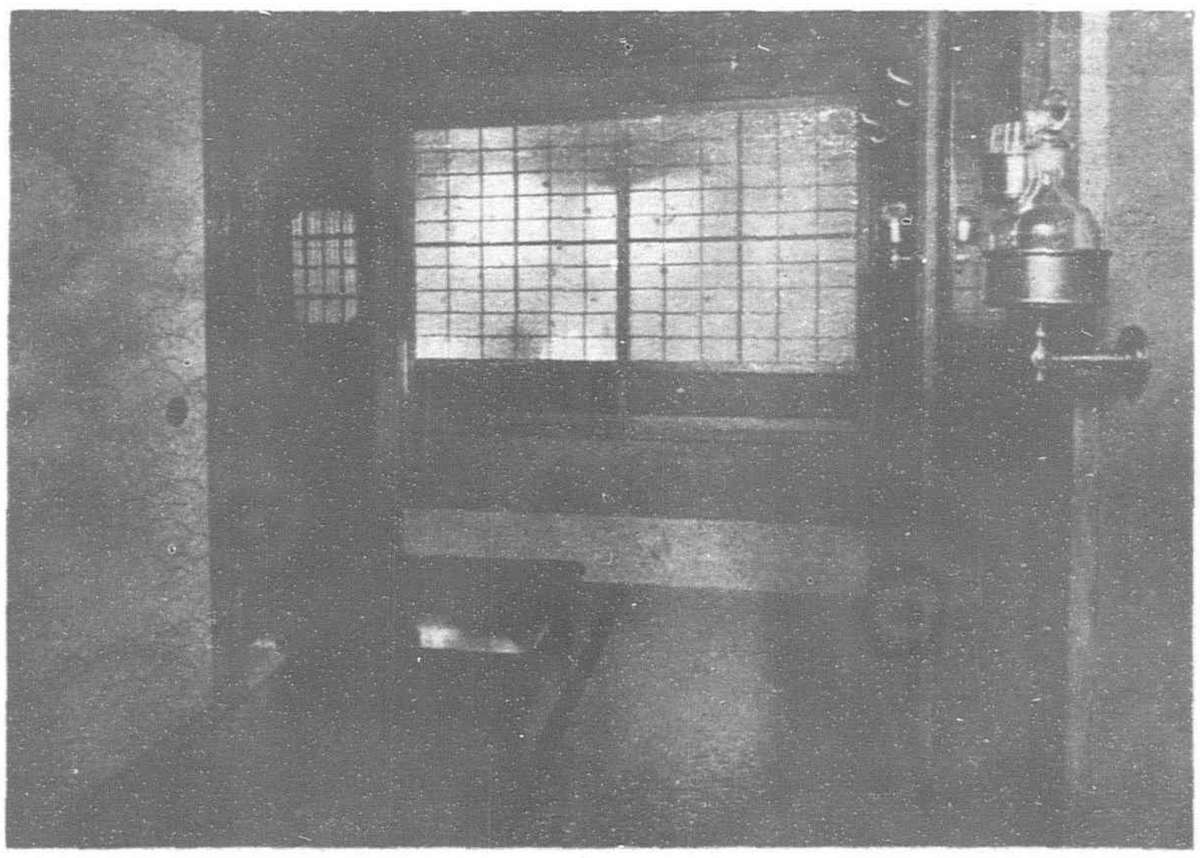
Special Room (European Style)



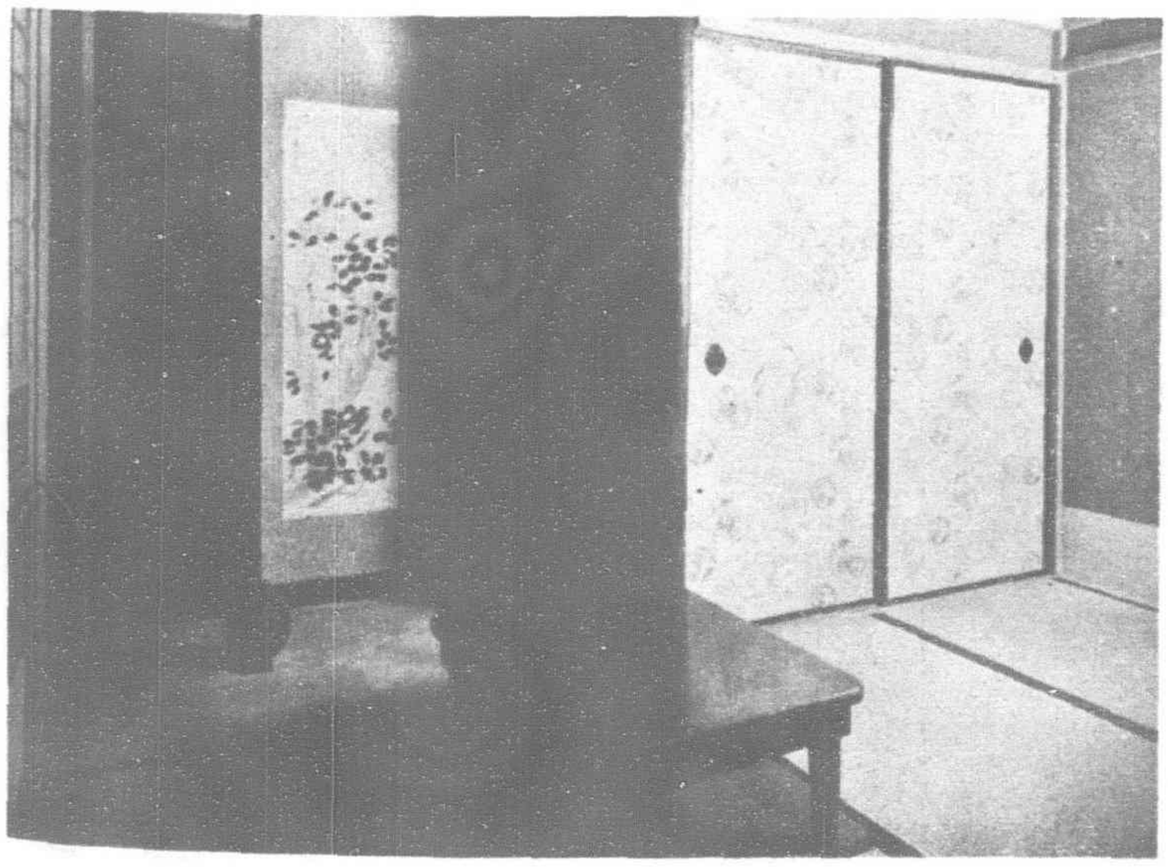
Special Lounge Room



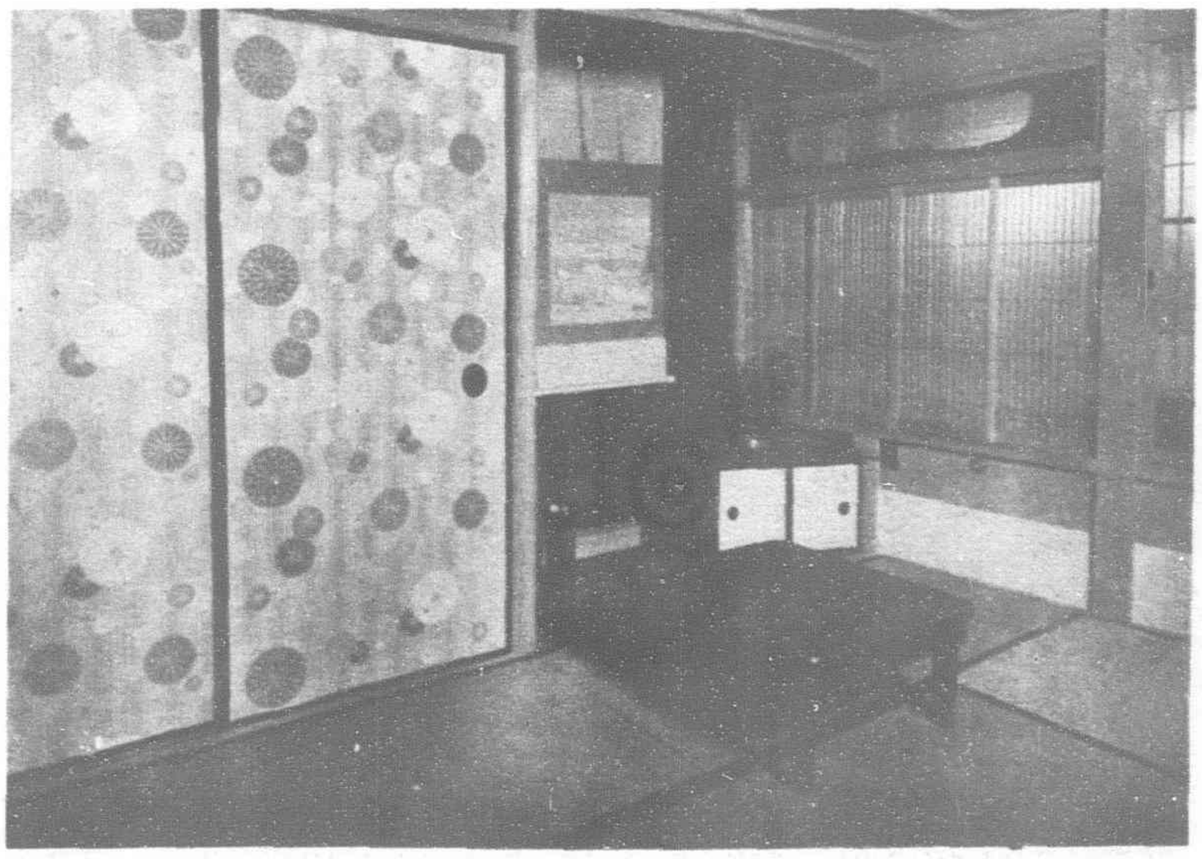
Special Room (Japanese Style), "Kiri No Ma"



Special Room (Japanese Style), "Tsuki No Ma"



Special Room (Japanese Style), "Hana No Ma"



Special Room (Japanese Style), "Kiku No Ma"

The special room located at the foremost part of boat deck is elaborately decorated in European style and can command an uninterrupted view through large windows, while the passengers repose on the comfortable sofas.

Deck Machinery and Lighting Apparatus

All deck machinery and the ship's lighting are electrical, and the electric power is supplied by the Mitsubishi Diesel generators installed in the engine room. A specially powerful electric windlass is installed on the forecastle, the capacity being 24 h.p., while a powerful capstan is provided at the stern on the upper deck for mooring purpose, the capacity being 20 h.p. The motors are of Mitsubishi Electric Engineering Company's make. At the aftmost part of the second deck, is the steering compartment. The steering engine, supplied by the Mitsubishi Electric Engineering Company, is purely home-made and is of the pure electric type on the Ward-Leonard system. On the boat deck, is equipped a 6 h.p., electric boat winch for lowering and lifting the motorboat.

There are two rudder-setters, one on the navigation bridge and the other on the promenade deck aftward which can be connected to, or disconnected from, the steering engine by means of a change switch.

All cabins and rooms are provided with decorated lighting sets, steam heaters, electric fans, bells, and other necessary equipment.

The funnel, masts and whole deck awning have illumination devices for the ship's decoration at night, whilst a searchlight of one kilowatt incandescent electric light is provided on the top of the steering compartment on the navigation bridge, in order to assure safe navigation at night even in foggy weather.

There are two life-boats, one "Temma" and one motorboat on the boat deck.

Main Engine and Auxiliaries

The main propelling machinery which was designed and constructed at the Kobe Shipyard and Engine Works, is one set of the Mitsubishi four cycle, airless injection, trunk piston Diesel engine, type PRH6, with six cylinders, developing normally 900 b.h.p. at 260 r.p.m.

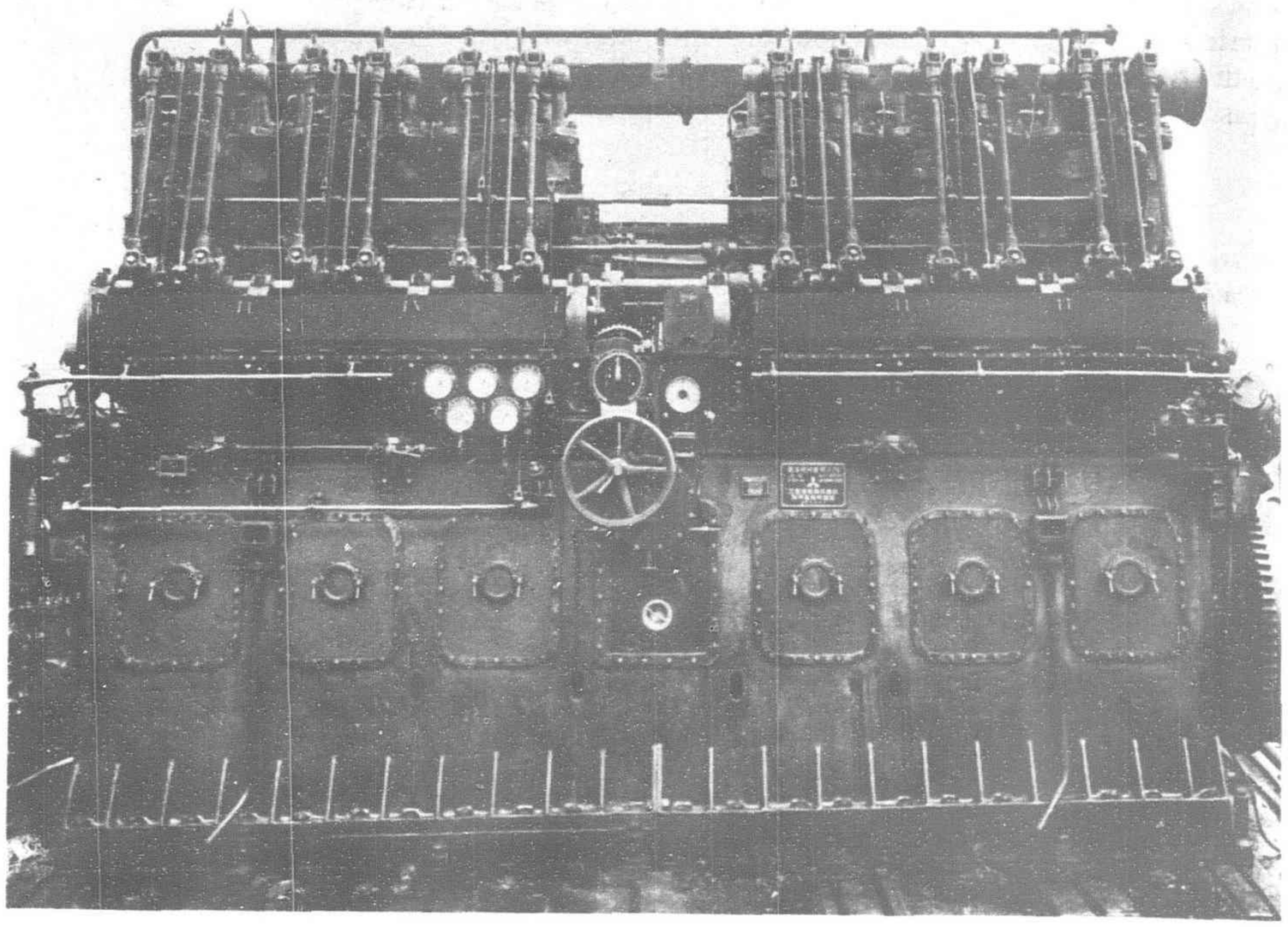
It is easy and simple of manipulation, highly efficient, powerful and robust in construction, being based on unrivalled workmanship and long years of experience possessed by the makers in Diesel engine construction.

The fuel oil injection device is of the famous Vicker's solid injection system with a small number of fuel pumps, which permits easy adjustment of the injection pressure, and also eliminates troubles in the fuel system as well as maintaining a high thermal efficiency over a wide range of revolutions and output.

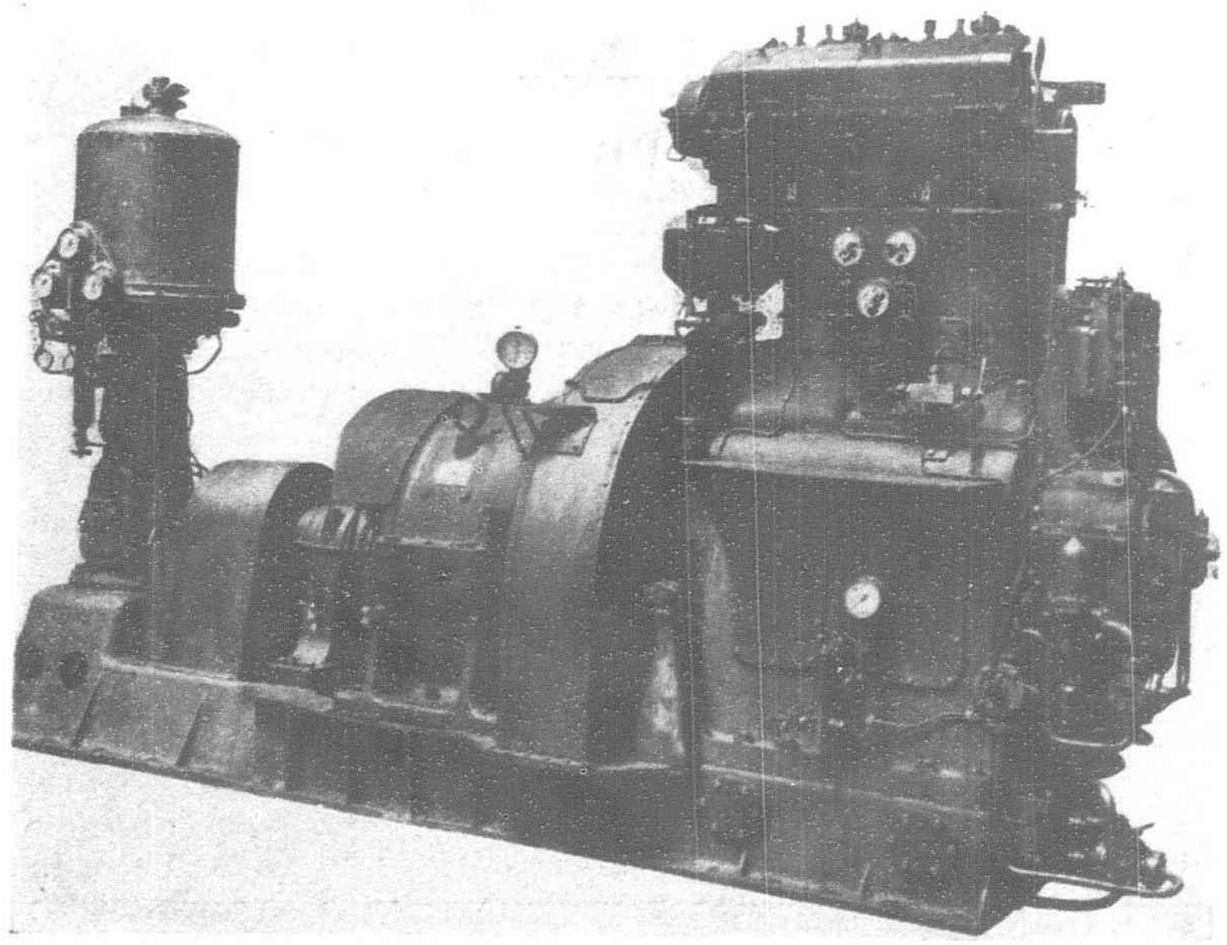
A special design was applied to this engine as to the shape of combustion chambers and the direction of injection, as a result of which combustion is excellent, and exhaust gas is entirely smokeless at any load.

Mitsubishi patent oil-wiping piston rings with two peripheral projections are fitted, in order to reduce the lubricating oil consumption.

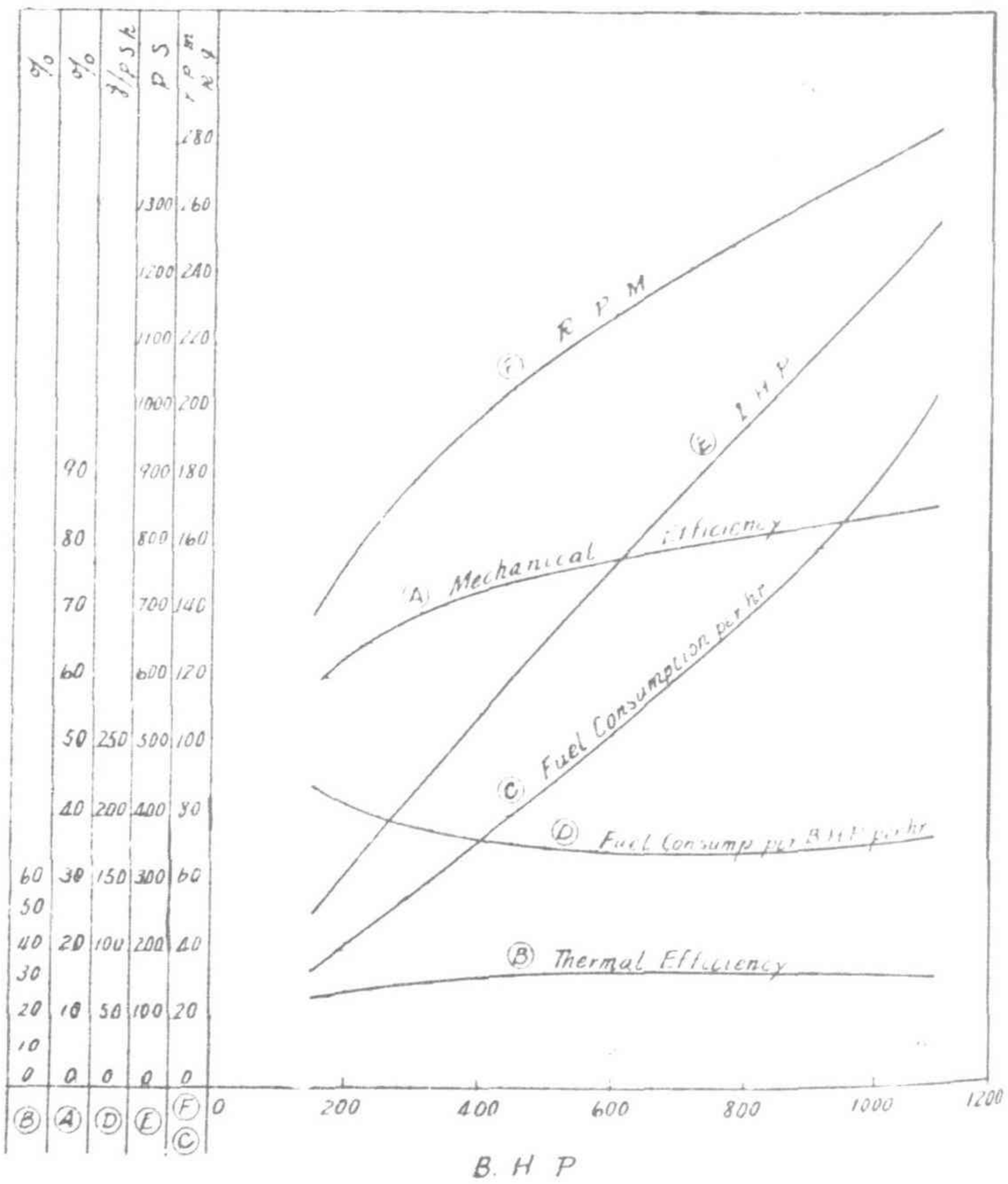
The manoeuvering device is also of the builder's patented design, in which the engine operates automatically ahead or astern



Main Diesel Engine of "Aoi Maru"



45 kw. Auxiliary Diesel Generator on "Aoi Maru"



by the turning of a single handle, anti-clockwise or clockwise, and the state of the engine performance and the variation of the output are indicated on a dial fitted near to the handle, so that the engine can easily be manoeuvered by even an unskilled engineer.

M.S. "AOI MARU" OFFICIAL SEA TRIAL RESULTS

Date of Trial				June 2nd, 1933.			
Place of Trial				Off Awaji			
Kind of Load				*½ Load*	*¾ Load*	*Full Load*	*10% Over Load*	*Minimum Load*
Ship Speed in Knots	..	..		12.063	13.339	14.311	14.708	—
R. P. M.	..	..	..	208	234.5	257	263.5	84
B. H. P. (PS)	..	..	..	470	669	883	968	28
Pressure Kg./Cm.²								
Fuel Injection Oil	..	..		340	380	420	430	110
Cooling Water	..	..		0.5	0.3	0.3	0.7	0.5
Piston Cooling Oil	..	..		1.0	1.2	1.3	1.5	1.2
Bearing Lub. Oil	..	..		1.1	1.4	1.3	1.7	1.3
Temperature °C.								
Piston Cooling Oil								
Oil Cooler								
Inlet	..	..	..	38	40	42	43	—
Outlet	..	..	..	24	25	26	27	—
Outlet	..	..	..	40	43	46	46	—
Bearing Oil								
Oil Cooler								
Inlet	..	..	..	38	40	42	43	—
Outlet	..	..	..	25	24	23	24	—
Engine Room		..	..	25	25	25	27	—
Sea Water	..	..	..	20	20	20	20	—
Cooling Water								
Lub. Oil Cooler								
Inlet	..	..	..	21	21	22	21	—
Outlet	..	..	..	21	22	23	22	—
Piston Cooling Oil Cooler								
Inlet	..	..	..	21	22	23	22	—
Outlet	..	..	..	22	23	24	24	—
Main Engine Outlet			..	33	38	43	41	—
Crank Case	..	..	..	36	38	39	40	—
Exhaust Gas Outlet			..	268	327	375	408	—
Thrust Bearing	..	..		35	37	39	41	—

The Chinese Cotton Industry

(Continued from page 348)

Mr. Fang. They have neither the learning of the trade nor the experience, and yet they know well how to take the advantage of their position in the way of satisfying their greed. When the World War brought about enormous profit to the Chinese mills, they declared handsome dividends, but there were mills which utterly neglected the redemption of machinery and other factory equipment. The factory superintendent or the business manager is generally a close relative of the President of the Company or of principal shareholders. And, the business of the factory may wane but never their private income. For they never forget to look after their personal welfare even at the cost of the entire enterprise.

(3) Low Efficiency: It is considered that the low quality of Chinese cotton products result from the low wages paid, but it is not true. Low efficiency is the cause. For instance: a Chinese mill hand working in a Japanese weaving factory in China turns out three times more textile than his compatriot working in a Chinese plant. This tends to prove that the wages paid by Chinese mills are higher in proportion to those paid by the Japanese mills in China, the actual sum paid notwithstanding. Simultaneously, it also tends to show that the machinery equipment as well as the general order of business management in the Chinese mills are deplorably inferior to those of the Japanese mills in China. It is easy to surmise, in the circumstances, what would be the likely outcome of a competition between the Chinese mills with their inadequate business management and inferior products and the Japanese plants in China with their orderly operation and superior product.

In conclusion, Mr. Fang warns the Chinese mill owners to reconsider the situation, predicting that their fate is sealed unless something is done to cope with the situation, especially if the Sino-Japanese dispute remains unsettled and the Chinese Government does not take proper steps to protect the cotton industry which is the most advanced and best organized of all the Chinese manufacturing industries.

Railway Electrification in Japan

(Continued from page 355)

having a capacity of 18,000 and 70,000 kw. From these two stations electric power required for railway operation in the Tokyo region can be supplied. Notwithstanding this fact, there being much excess electric power in the vicinity of Tokyo, approximately one-half of the power needed to-day is bought at a low rate from private companies.

At the present time the demand for electric power is increasing constantly. To accommodate this increased power demand for future electric operation on the railroads, a water-power plant located on a site along the Shinano River, with an estimate capacity of 84,000 kw., is now in process of construction.

Railway Signaling

Automatic Block Signals.—Disc-type automatic block signals were the first automatic signals to be installed on Japanese government railroads. These were along the electrified section between Ochanomizu and Nakano on the Chuo line. They were controlled by D.C. track circuit, but later the rails served to return the circuit of propulsion current when the single-trolley system was adopted. F-type semaphore signals were employed in 1913 for the Yamate beltline in Tokyo when it was equipped with automatic signals.

Due to the interference caused by trolley wires, feeders and their supports along electrified sections, semaphore signal indications were difficult to recognize. Consequently, as a result of the superi ority of color light signals, since 1926 they have been installed almost altogether. To-day all electrified sections are equipped wtih color light automatic signals. The total track length along which they are used reaches 661.9 kilometers; their number is 1,248.

Power Interlocking Plants.—In the beginning automatic block signals were installed only at intervals between stations. Since about 1921, mechanical signals in railway yards have been replaced gradually by semi-automatic signals. An electric interlocking plant was installed for the first time at Tamachi station, and power interlocking equipment, as well as various other electric locking devices, is installed in busy station yards. Existing power interlocking installations on electrified sections includes 23 electro-mechanical interlocking plants, 20 electric interlocking plants and one electro-pneumatic interlocking plant.

Automatic Train Stopping Devices.—Two-minute headway service is carried out on all rapid transit lines in the Tokyo metropolitan area. Along the right-of-ways of these various lines, automatic train stopping devices are being put in.

Railroad Crossing Safety Apparatus.—Crossing gates and signals are in constant use as safety measures at railroad crossings. The former in most part are manually operated, while to a few of them electric power is available. All of the latter are operated automatically.

Chalainor Coal Mines

According to Japanese press reports the Manchukuo members of the Board of the Chinese Eastern Railway are in favor of re-conditioning the railway coal mines at Chalainor, which were badly damaged during the military operations at the time of the Sino-Soviet conflict.

It is estimated that at least one million gold roubles will have to be expended before the mines can be satisfactorily exploited, and, as it is anticipated that the railway earnings for 1933 will show a decrease in comparison with previous years, it is thought that the project will possibly have to be held in abeyance, or curtailed.

Owing to the Chalainor coal mines being unworkable, and seeing that there is no other coal mine on the western section of the railway, the Chinese Eastern Railway, since the Sino-Soviet conflict, has had to purchase large quantities of Siberian coal to meet its requirements. Consequently, if this property is re-conditioned, it follows that there will be no necessity for placing any further orders with the Soviet Government for Siberian coal.—*Reuter.*

Engineering Notes

INDUSTRIAL

JAPAN IRON MERGER—In connection with the proposed establishment of the Japan Iron Manufacturing Company and the consequent merger of private iron concerns, assets of the Government Steel Works to be offered are valued at Y.163,934,783. These assets include Y. 50,517,160 of structures; Y.49,511,625 of machinery; Y.25,579,854 of buildings; Y.19,708,184 of land; Y.2,943,520 of shipping; Y.6,477,602 of important implements; Y.4,784,787 of mining concession; Y.68,618 of industrial rights; and Y.4,343,429 for works unfinished.

JAPAN BUYING SCRAP.—Los Angeles.—Thousands of tons of discarded motor-cars are finding their way to the steel mills of Japan. Although the Japanese have for years been purchasing metals in the shape of everything from junked rails to steamships, an increase of more than 2,000 per cent in the exports of junk from the Los Angeles harbor has been noted since Japan began its invasion of China. Records of the Marine exchange show 63,855 tons of "iron and steel semi-manufactures" shipped last year, as compared to 1,025 in 1931, mostly bound for Japan. The head of a large wrecking company said that he began shipments in February on a year's contract to supply the Japanese Government with 3,000 tons of scrap iron and steel a month. "I expect to scrap and ship upwards of 50,000 motor-cars this year," he said. "When the American steel mills were operating near capacity, they bought most of the scrap metal from this area. But now they were buying little and junk metal prices have dropped about 50 per cent. Japan has increased its purchases. Metal which it does not use it resells to Italy."—

HARBIN GAS PLANT.—There seems to be a chance of having gas in Harbin, the largest gas companies in Tokyo and Osaka being interested. The introduction of gas, says a Harbin letter, will be an enormous boon to the town and there is not the slightest doubt that as soon as the works are completed the demand will probably exceed the expectations of the new company.

PROPOSED RAYON FACTORY.—Mr. K. Fujita, former president of the Tokyo Chamber of Commerce and Industry, in conjunction with Mr. Y. Okawa, son of Mr. Heizaburo Okawa, of the Fuji Paper Co., is planning a new rayon manufacturing company in Japan on a large scale. Experts are selecting a site and are said to have narrowed their choice down to Fushiki or Nanao in Ishikawa Prefecture. The idea is to produce both rayon and pulp and the plant intends to start with a daily capacity of two tons of the former and five tons of the latter. It also is reported in the vernacular press that the concern will set up a separate pulp plant in either Korea or Saghalien. It hopes to be able to use Formosan sugar cane as raw material.

AVIATION

CHINESE AIRPORTS—Three new aerodromes have been completed in China, at Ningpo, Linhai and Yungchia, all in Chekiang province. It is learned that the proposed Shanghai-Canton air line of the China National Aviation Company will pass through Hangchow and the machines will land at Ningpo and Wenchow on their way to Canton.

JAPAN PLANS AIRPORTS—Tokyo Communications Office has decided to build three commercial airports, each with an area of slightly more than 130 acres, on the northern stretch of Japan's proposed trunk airway. These airports will be erected at Sendai, Aomori, and Sapporo for which the Finance Office has consented to appropriate Y.1,100,000 for the current year. The Government intends to start construction work immediately upon obtaining the Diet approval.

SHANGHAI - TACHENG SERVICE.—A complete schedule of the time-table and passenger fares for the Shanghai-Tacheng Airway in China is announced by the Eurasia Aviation Corporation, the service being inaugurated in December. The postal authorities have been notified and mails for the North-west will be received for transport by air. After the first flight to Tacheng (Sinkiang) on December 15, future flights are to be made on Tuesdays, one plane leaving each terminus weekly. The entire distance, totaling 4,050 miles, will be covered in four days.

JAPANESE PLANES—The manufacture of aeroplanes is now being seriously taken up in Japan and it is claimed that Japan can make machines which compare with the best produced in western countries. Both the War and the Navy Ministers have announced that their departments are giving serious attention to the production of aeroplanes. An aeroplane manufacturing plant has been established by the Navy, and, while it is admitted that Japan was late in starting aeroplane manufacture, it has been announced that much progress has now been made and there is no need for public anxiety regarding the production of 'planes.